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CONTENTS

THE WEATHER OF 1947 IN THE UNITED STATES (2 figs. and 2 charts). L. H. Seamon.....	Page 239	SOLAR RADIATION AND SUNSPOT DATA:.....	Page
PRELIMINARY REPORT ON TORNADES IN THE UNITED STATES DURING 1947. L. V. Wolford.....	247	Solar Radiation Observations.....	273
NORTH ATLANTIC HURRICANES AND TROPICAL DISTURBANCES OF 1947 (1 chart). H. C. Sumner.....	251	Positions, Areas, and Counts of Sunspots.....	275
METEOROLOGICAL AND CLIMATOLOGICAL DATA:		Provisional Relative Sunspot Numbers for December 1947.....	277
Aerological Observations.....	257	Charts I-XI.	
River Stages and Floods.....	265		
Climatological Data.....	267		



CORRECTION

MONTHLY WEATHER REVIEW, November 1947, vol. 75, No. 11, p. 212: The figures appearing at the top of the page are reversed, as the legend for Figure 1(a) refers to the figure which appears above the legend for Figure 1(b), and correspondingly, the figure referred to in legend 1(b) now appears above legend 1(a).

p. 214: line 7 should read "is referred to as..." instead of "is referred to a..."

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THE WEATHER OF 1947 IN THE UNITED STATES

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[Weather Bureau, Washington, D. C.]

The dependence of agriculture upon the vagaries of the weather was clearly demonstrated in the effect of weather sequences upon the 1947 corn and wheat crops. Cool, wet weather in the Wheat Belt during early spring, followed by drier weather with plenty of sunshine in May and June, was ideal for the greatest total production and highest yielding wheat crop in the history of the Great Plains. On the other hand, the cool, wet weather in the Corn Belt during spring months, preventing soil preparation and planting, continued well into summer, when excessive rains and record floods considerably reduced the planned acreage. Another blow was delivered to the corn crop by a heat wave which prevailed in the Central areas from the latter part of July until the middle of September. Although a late fall in the Midwest was favorable to allowing much late corn to mature, production was cut to some extent by early frost in Ohio and portions of the Lake States. Lack of rain in the Southwest and southern Great Plains during the autumn delayed seeding of a great portion of the winter wheat crop and prevented normal growth, with the result that the wheat was in poor condition to go through the winter. Generally, however, the autumn season was warm and dry and especially favorable for harvesting. Significant of mention in the early part of the year also was the cold wave which struck Florida in February, damaging truck and citrus crops severely.

The year 1947 was notable, too, for the record property losses resulting from severe storms. Hurricane losses totaled about \$135,000,000, more than 13 times those of 1946, and 53 lives were lost. Total tornado losses of nearly \$24,000,000 were approximately double those of 1946; and the loss of life, numbering 306, was about 4 times that of 1946. (See articles on hurricanes and tornadoes elsewhere in this issue and tables of "Severe Local Storms" in each issue of this publication for 1947.)

Temperatures.—The mean temperature for the year, derived by weighting the average temperatures of the different States according to their areas, was slightly above the average for the period 1886 to 1947. Temperatures averaged about normal for the year over most of the country, ranging from somewhat above normal in Florida and New England to considerably below in the extreme Northwest, and registering somewhat below in large areas of the Ohio Valley and South-Central States. Annual averages were as much as 2 to 4 degrees above normal in western Washington and northern Oregon. For the year's highest temperature, Cow Creek, Calif., recorded 126° F., on July 19, a figure 8° below the all-time high. The lowest temperature of -43° F. was

recorded at Gavilan, N. Mex. (7,350 feet elevation), on January 16, a reading 23° above the all-time low.

An interesting pattern is presented by the variation of 1947 temperatures from the normal. In January they averaged above normal in the East, below in the West, although the reverse was true for February through May, inclusive. June temperatures averaged above normal for the southern one-third of the country and below normal for the northern two-thirds. Geographic distribution changed in July, with the western two-thirds of the country experiencing above-normal heating while the eastern one-third average was below normal. For the next 3 months averages were generally above normal, dropping to below in November and rising again to above normal in December.

Table 1 shows the monthly and annual State temperature departures, and their areal distribution is shown by the annual temperature departure chart following this article.

Precipitation.—The average annual precipitation for the country as a whole, based on weighted averages, was 28.78 inches, 0.39 inch less than the average for the period 1886 to 1947, or very near the normal. Figure 1 gives the percentages of normal precipitation by States for 1947; Figure 2, the percentages for the growing season; Table 2, the percentages by month and for the year; and Table 3, the monthly and annual amounts. The areal distribution of the percentages of normal is presented by the chart following this article. It shows a rather broad belt of above-normal precipitation extending from New England westward to the central Rockies, thence north-

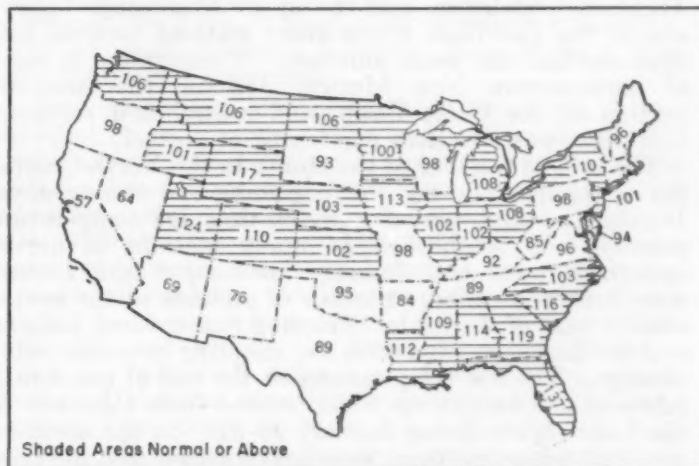


FIGURE 1.—Percentage of normal precipitation, 1947

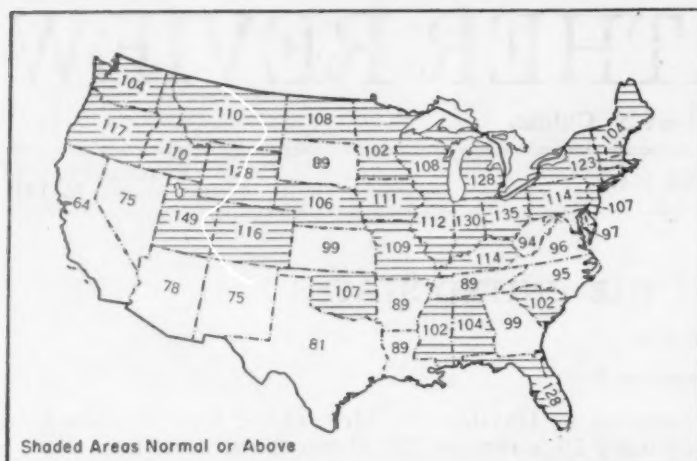


FIGURE 2.—Percentage of normal precipitation, April 1-September 30, 1947

westward through western Montana, northern Idaho, and northern Washington. Another belt of above-normal amounts included the coastal areas from eastern Texas to central Virginia. Precipitation was only one-fourth to three-fourths of normal in California, Nevada, Arizona, and New Mexico.

January.—January was generally warmer than usual, although temperatures were near or below normal in the Far West, including Idaho, southwestern Wyoming, western Colorado, New Mexico, and all of Texas, except the northern portion. Relatively warmest were the North-Central States, where temperatures averaged 6° to 12° above normal. During the first week of the month temperatures ranged above 3° warmer than usual in the Dakotas, while in Texas they averaged from 18° to 21° colder than usual. The second and fourth weeks were warm, especially the fourth week, when practically the entire country enjoyed unseasonably warm weather, with temperatures in South Dakota averaging 24° above normal.

Total precipitation was heavy over the eastern one-third of the country and in south-central Texas, Iowa, and eastern Nebraska, and more than twice the usual amounts occurred in sections of Tennessee, Alabama, and Mississippi. Elsewhere totals were below normal, especially in the Florida Peninsula, Missouri, western Arkansas, Oklahoma, and the upper Mississippi Valley, and in the Far West where many stations received less than one-half the usual amounts. Precipitation in most of northwestern New Mexico, Arizona, the southern portion of the Great Basin, and central and southern California was less than one-fourth of normal.

The coldest weather of the month in the North-Central States occurred during the beginning and closing days. During the first period new, all-time low-temperature records were established at many stations in northeastern Kansas, and January low-temperature records were broken at a large number of stations in the southeastern part of the State. Freezing rain covered Indiana and northwestern Ohio with ice, resulting in considerable damage. The low temperatures at the end of the month followed a severe storm which moved from Colorado to the Lake region during January 29-31. In the northern sector of this storm there were heavy snows, freezing rain, sleet, and widespread thunderstorms. Winds of gale force piled the heavy snow into high drifts, virtually isolating many cities in southern Wisconsin, northern

Iowa, and Illinois. A belt of sleet and freezing rain extended from extreme southern Iowa through the Chicago area into extreme southern Michigan, with freezing rain extending into Ohio and New York. In the southern sector of the storm violent thunderstorms and tornadoes were reported from Missouri, Arkansas, Tennessee, Georgia, Alabama, and Ohio. A series of destructive tornadoes occurred in northeastern Missouri on the 29th, and a heavy dust storm and damaging winds occurred in Oklahoma on that date. Southerly winds along the Atlantic, induced by this Midwestern storm, brought unseasonably high temperatures as far north as New England. The high afternoon temperature in Washington, D. C., was 73° F., on January 30, a record for that date.

February.—This month was considerably colder than usual east of the Rocky Mountains, except eastern Montana, the Dakotas, northwestern Minnesota, northern Michigan, and much of New England, while mild weather generally prevailed in the Rocky Mountain and Pacific States. Average temperatures for the month ranged from 6° to 8° below normal in portions of West Virginia, Kentucky, Tennessee, and Mississippi, to 6° above normal in the Great Basin of the Far West.

An unusual southward movement of cold polar air on the 5th and 6th brought below-freezing temperatures to the entire mainland of Florida. Low temperatures in the Everglades ranged from 25° F. to 30° F., remaining below freezing from 4 to 8 hours. Truck and citrus suffered heavily, and monetary losses were estimated at \$50,000,000. Although no absolute minimum temperatures were broken, this was the coldest February in Florida since 1895.

This month was much drier than usual. Principal exceptions were most of Florida and Maine, extreme northern Michigan, and a narrow belt extending from west-central Montana along the Continental Divide to southern Colorado. Generally less than one-fourth of the usual amount of precipitation was received in South Carolina; most of Georgia; and a large area extending from the southern Lake region and lower Ohio Valley southwestward across the southern Great Plains into Texas, southern New Mexico, and southern Arizona. It was the driest February of record in Wisconsin, Illinois, Indiana, Ohio, Missouri, Kentucky, Oklahoma, and Mississippi, and the second driest of record in Arkansas and the Carolinas. In South Carolina the dry weather with high winds was responsible for 1,900 forest fires which burned approximately 100,000 acres of forest land.

February snowfall was below normal in Wisconsin; the States south of Tennessee and North Carolina; all States west of the Mississippi; and especially in the Pacific States. All the remaining States received more than the usual amounts, some more than twice the normal. Total snowfall in West Virginia was the greatest of record for February, mostly occurring on the 20th and 21st. The wind caused much drifting in this State, and Canaan Valley reported drifts from 15 to 50 feet in depth.

There was a severe blizzard on the 6th, 7th, and 8th in northwestern North Dakota. The wind blew drifts 12 to 15 feet deep which blocked highways and branch railroads. Numerous dust storms in the Great Plains during the first week of the month caused some soil erosion and in some cases reduced visibility to one-fourth mile, but no serious damage resulted.

March.—In contrast to the March weather of 1945 and 1946, this month in 1947 was generally cold east of the Continental Divide, although eastern New York, New England, and the extreme northern portion of the North-Central States were normal to slightly above in tempera-

ture. Virginia and West Virginia had the coldest March of record; Louisiana, Mississippi, and North Carolina had the second coldest of record; and new low-temperature records were set in eastern Kentucky on the 28th. Killing frosts occurred in Georgia as late as the 29th.

Precipitation was slightly above normal in portions of the Northeast and Northwest, in the southern Great Plains, Georgia, South Carolina, and the Gulf States, but was near or slightly below normal elsewhere in the country.

There were three significant cold waves east of the Rockies during the month. At the beginning of the month the first one brought freezing temperatures to the Gulf of Mexico. Low temperatures in Mississippi ranged from 16° F. to 28° F. This cold wave was preceded by a severe snowstorm in the Middle Atlantic and New England States, and much of the above-normal March snowfall which these States received fell during this storm. Many roads were blocked in Pennsylvania, and 25 inches of snow fell at Pleasant Mount on the 2d and 3d. In New York total snowfall for the storm ranged from 1 foot to 4 feet; severe drifting resulted in blocked roads, damaged power lines, isolation of communities, and closing of schools. At Readsboro, Vt., 50 inches of snow fell during this storm, and 47 inches fell at Peru, Mass.

The second cold wave occurred east of the Rockies about the middle of the month, following a storm attended by heavy rains in central Gulf States and in the eastern portion of the central and southern Great Plains. A series of tornadoes, hailstorms, and windstorms occurred in Louisiana on the 12th, which caused heavy damage and the loss of two lives.

The third cold wave followed a severe storm in the Northeastern States on the 25th and 26th. Freezing rain, sleet, and heavy snow damaged service lines and impeded traffic in Illinois. Snow drifts blocked roads and isolated communities for days in southern and eastern Michigan and hampered transportation in New York. Bus service was suspended and schools closed in northeastern Ohio, where 10 to 12 inches of snow fell. Severe winds which accompanied this storm caused millions of dollars worth of damage, principally in Pennsylvania; winds of 90 m. p. h. were recorded at Pittsburgh, Pa., and winds of 70 m. p. h. or more were reported from North Carolina and West Virginia. Snowfall was also heavy in other sections, Virginia and West Virginia recording the heaviest average March snowfall of record.

April.—Temperatures averaged somewhat cooler than normal in New England, the Lake region, the Great Plains, and in much of the central and northern Rocky Mountain region, while the country was warmer than average elsewhere. In the Great Valley of California high temperature records were broken or equaled at several stations.

Precipitation was heavy over the eastern half of the country, including the central Great Plains but excluding much of New England, Tennessee, North Carolina, Virginia, and West Virginia. A few sections of Nevada, Utah, Wyoming, Montana, and eastern Washington also reported above-normal amounts. More than twice the usual precipitation fell at many stations in a belt extending from Kansas and Nebraska to southern Michigan as well as in the east-central Gulf Coast region; less than half the usual amount fell in most of California, Arizona, New Mexico, and much of Texas. It was the second wettest April of record in Indiana, Iowa, and Oklahoma, and the third wettest in Michigan. This cool, wet weather seriously delayed farming operations in many

northeastern and central States from 2 to 3 weeks. Arizona, however, received only about 6 percent of the normal moisture.

Damaging floods occurred from Missouri and Illinois to western New York and Pennsylvania. In southern Michigan floods and heavy precipitation during the first week caused an estimated \$4,000,000 damage.

Hail, windstorms, and tornadoes caused damage estimated at over \$12,000,000. Most of this loss was due to the unusually destructive tornado that killed 167 persons as it passed from White Deer, Tex., through Woodward, Okla., to St. Leo, Kans., destroying property to the extent of nearly \$10,000,000.

May.—May was cooler than usual from the Western Plains eastward almost to the Atlantic Coast, with temperatures averaging about 2° to 6° below normal in the North-Central States. On the other hand, it was considerably warmer than usual in the Rocky Mountain and Pacific States, with temperatures averaging 6° or more above normal in the central portion of this area. During the first few days of the month temperatures were extremely high in the far Southwest. Maximum records for so late in the season were broken throughout the State of Arizona: the Flagstaff high temperature on the 3d was 14° above the previous high for that date, and temperatures at 24 stations exceeded 110° F. In Nevada, Idaho, New Mexico, and Utah, many early-season maximum temperature records were set as well. This month was the warmest May of record in Washington, and the second warmest in the Great Valley of California.

During the second week of the month a cold air mass overspread the eastern United States, bringing freezing temperatures as far south as Tennessee and southern Virginia. Widespread frosts caused considerable damage in the Ohio Valley, Maryland and Virginia, and some damage in Tennessee and the Carolinas. A new low May temperature average of 16° F. was recorded in Pennsylvania.

May was drier than usual in southern Virginia, North Carolina, along the south Atlantic coast, and in an extensive area from the upper Mississippi Valley westward over the Northwestern and Pacific States; elsewhere amounts were generally above normal. Less than half of the usual precipitation fell in the Florida Peninsula and in the area from the Dakotas to the North Pacific States generally, while totals were twice the normal in sections of New York, Pennsylvania, New Jersey, southern Utah, southern Arizona, southern New Mexico, and along the north Texas coast.

It was the wettest May of record in New York, where damaging floods occurred. The cool, wet weather in the North-Central, Middle-Atlantic, and New England States further delayed farm work and caused slow growth of vegetation. Heavy snowfall in Nebraska and Wisconsin on the 28th and 29th set new May records. Depths were as great as 12 inches in western Nebraska and 4 to 8 inches in central Wisconsin. An average total snowfall of 1.1 inches in Iowa was a May record for that State. Winds on the 8th and 10th in the Great Valley of California caused an estimated damage of \$1,000,000 to crops. Floods in Oklahoma caused losses estimated by the State Highway Commission at \$1,000,000. Five tornadoes in this State damaged property to an estimated extent of \$1,260,000. One of these in its approach to Leedy, Okla., was closely watched for 30 minutes, and although property damage was about \$1,000,000 in a community of 600, only 6 lives were lost and 15 persons injured.

June.—This month was unseasonably wet and cool in the northern two-thirds of the country and rather warm and dry in the southern one-third, except that temperatures averaged somewhat below normal in Alabama and Georgia. Temperatures in the central Rockies during the last two-thirds of the month, and in the North-Central States during the third and fourth weeks were much below normal.

Precipitation followed much the same geographical pattern as the temperature, with above-normal amounts falling in the northern two-thirds of the country and near- or below-normal amounts in the southern one-third. More than twice the normal amounts fell in Iowa, Nebraska, Wyoming, Utah, and the Pacific States. It was the wettest June of record in South Dakota, Nebraska, central Illinois, and northern Missouri, and the average rainfall in Iowa exceeded the previous record by more than 2 inches. In the extreme Southwest accumulated deficiencies of rainfall reached the drought stage, and water supplies were critically short in some localities.

On the 19th a thunderstorm of cloudburst proportions occurred at Lake Charles, La., with a total of 15.79 inches of rain falling in about 8½ hours: 15.38 inches fell between 6:00 a. m. and 12:00 noon, the greatest 6-hour amount ever recorded in an automatic gage anywhere in the United States.

June was outstanding for the severe and prolonged floods which followed the heavy, and in some cases unprecedented, rain which fell in the lower North-Central States. Floods in the central Mississippi and lower Missouri River basins were the worst in more than a century. Damage caused by these floods probably exceeded \$100,000,000. Intended acreage of corn was reduced considerably in flooded areas, and wet soil in surrounding areas delayed planting from 2 to 4 weeks.

There were also many destructive storms during June. The first was a tornado which struck near Pine Bluff, Ark., on June 1, killing 35 people, injuring 300, and causing damage estimated at \$1,000,000. Heavy rains on the 2d and 3d caused a power dam to collapse at East Pittsford, Vt., resulting in \$2,000,000 worth of damage. Hail damage in Kansas totaled nearly \$7,000,000, and wind and hail damage in Nebraska was near \$3,500,000. A tornado caused three deaths and property damage exceeding \$1,000,000 in its passage across Mercer County, Pa., on the 8th. Damage by a hailstorm in the area surrounding the towns of Haxteen, Fleming, and Holyoke, Colo., on the 29th was estimated at \$2,000,000.

July.—The month was cooler than normal in the eastern one-third of the country except for New York and New England, in the interior of California, in most of Nevada, and in extreme southwestern Oregon. Elsewhere temperatures were near or above normal. The minus departures were 4° or more in much of the Ohio Valley. Temperatures averaged the lowest of record in the lower Ohio Valley, Tennessee, South Carolina, and Georgia. It was not only the coolest July of record in Kentucky, but low-temperature records of many years' standing were broken in most sections on the 23d, at some western stations by more than 5°. Record-breaking low temperatures were recorded in Tennessee on the same morning.

Precipitation during July was below normal, except in New York, Pennsylvania, New England, Florida, and the Pacific States. Several States west of the Mississippi received less than 50 percent of usual July amounts: Nevada had only 10 percent of normal moisture, with only 20 out of 72 stations in this State reporting measurable precipitation. Drought conditions continued in

Arizona, and it was the second driest July in Idaho since 1893. At a number of stations in the Southwest there was no precipitation.

A great many severe local storms occurred during the month, resulting in more than 20 deaths and property damage exceeding \$13,000,000. A severe hailstorm on the 3d, with stones ranging in size from marbles to oranges, caused \$350,000 damage in Stafford, Pratt, and Kingman Counties, Kans., mostly to wheat ready for harvest. Heavy hail on the 11th damaged small grains in the Lewistown, Mont., area to an estimated extent of \$1,000,000. A severe hail and windstorm in Morrill, Box Butte, and Cheyenne Counties, Nebr., on the 21st caused \$3,000,000 damage, mostly to the wheat crop. Hail and wind caused \$1,000,000 damage in southwestern Iowa on the 12th.

August.—With the exception of Florida, extreme southern Texas, southwest Washington, and most of Nevada and California, temperatures were above normal. It was generally one of the hottest Augusts of record, and the extremely high and prolonged temperatures in the North-Central and South-Central States broke many records. It was not only the hottest August of record in Illinois, but the second hottest of any month in the climatological history of the State, and it equaled the existing record for the amount of sunshine. At La Salle, Ill., there were 13 days when temperature readings were 100° F., or above, and at Springfield and Cairo, Ill., there were 27 days with maximum temperature readings of 90° F. or higher. These readings set new all-time records for any month for those stations. This was also the hottest August of record in Indiana, Michigan, and Ohio. Bismarck, N. Dak., had 6 days with maximum temperatures above 100° F., which was 4 more days than such readings had been recorded for any other August since 1875. In North Dakota there are normally 5 days in August with temperatures above 90° F.; this year there were 11. In South Dakota temperatures above 100° F. occurred on half the days in the month. At a few southern stations in Nebraska there were 20 days with maximum temperatures of 100° F.

Precipitation was below normal over most of the country, with only scattered areas where recorded totals were normal or above. The largest area with above-normal amounts included Utah, Arizona, Montana, and adjacent areas in the Rockies. Much of the Ohio Valley, parts of Florida, and extreme southern Texas also had more than the usual rainfall. A large area, including the Mississippi Valley and extending to the Rocky Mountains, had only about half the usual moisture. The combination of scanty rainfall and high temperatures caused considerable deterioration of crops in the Corn Belt.

There were many damaging hailstorms in Montana during August, where a few unusually destructive ones caused more than \$1,000,000 damage each; total hail damage for the State probably exceeded \$7,000,000, mostly to small grains. On the 9th a heavy rain in Needles, Calif., and vicinity washed out highways, railroad tracks, and flooded an ice plant, causing damage estimated at \$1,000,000.

A tropical disturbance entered Texas in the Port Isabel area on the 1st, causing \$2,000,000 damage to the cotton crop, although the additional moisture was beneficial to other crops. On August 24, a small tropical disturbance moved in over Galveston, Tex., where a maximum wind of 70 m. p. h. was recorded at the airport. Total damage done by this storm was about \$757,500; of that amount, \$500,000 was to property, the remainder to crops.

September.—Temperatures for the month averaged above normal except in North Dakota, northern Minnesota, and the extreme northeastern portion of Montana. Temperatures were more than 3° above normal in the southwestern and much of the central portions of the country. Much warmer than usual weather in the eastern half of the country during the first 3 weeks changed to considerably cooler thereafter, accounting for the lack of extreme departures from normal. This pattern was reversed in large portions of the West, with temperatures remaining below normal until the last week, then rising to much above normal. In the central Great Plains the weather was as hot during the first two weeks as in August. High temperatures of 107° F. and 112° F. were registered in southeastern Nebraska on the 3d. The first 10 days were the hottest of the season in Oklahoma, and the all-time high of 115° F. for the month was equaled at Alva, Okla., on the 3d. Near-record high temperatures occurred generally over Louisiana, and numerous heat records were set in Arkansas.

The distribution of precipitation was extremely erratic. Greater than usual amounts fell in central and southeastern coastal areas, the lower Ohio Valley, a portion of the North-Central States, the Lake region, a considerable portion of the northern Mountain States, and extreme southern California. Heavy rains caused streams in North Carolina to overflow: Raleigh suffered extensive property damage as did Washington and Greenville, on 20th; Greensboro and High Point, on the 24th and 25th, suffered considerable damage to public property, streets, bridges, and dams. This excessive moisture was not the rule, however, in the Southwest, where many areas received less than one-fourth the usual amounts of precipitation and a few recorded none. These dry conditions delayed the seeding of much wheat and were unfavorable for germination and growth of that previously seeded.

The cool weather in central areas during the latter part of the month caused damaging frosts in a number of sections. The worst was in Ohio where frosts on the 23d and 27th were believed by many competent observers to have caused greater crop damage, especially to corn, than any early frosts for 30 years or more. The loss was augmented greatly by the lateness of the crop, since many fields were still green.

On the 5th and 6th in dry areas of central South Dakota, a prairie fire covering 500 square miles destroyed hay, farm buildings, fences, livestock, and poultry. Total losses were estimated at \$2,000,000.

A severe hurricane moved across southern Florida on the 17th and northward across Louisiana on the 19th, accompanied by winds of over 100 m. p. h. Total damage was estimated at \$110,000,000. From September 26–30 prolonged northeast winds caused abnormally high tides and heavy surf along the Florida beach from Fernandina to New Smyrna. Sea walls were washed out, and buildings were undermined and collapsed, resulting in damage estimated at about \$4,000,000.

October.—With the exception of a small area in northwestern California and extreme southern Florida, October temperatures averaged above normal throughout the country. Highest monthly departures were about 10° in North-Central States. Warm weather persisted throughout the month, with the exception of a few relatively cool days in the Ohio Valley and central and southeastern Coastal States during the first week; in the central Mountain States during the fourth week; and in the Central Valley of California during the second week. During the week of the 14th to the 21st, temperatures averaged 15° to 18° above this week's normal for the North-Central areas. This unusually warm weather in central areas resulted from a combination of incoming warm southerly

winds and westerly winds warmed by their descent from the Rockies. Among the many October high-temperature records which were broken was that for Kansas, where a new record was set on the 5th, as 102° F. was recorded at Concordia.

Precipitation was extremely irregular in distribution, although for the country as a whole it was near the normal. Areas with below-normal precipitation included the southern tier of States from Alabama westward through southern California, the central and southern Great Plains, Minnesota, Wisconsin, Michigan, the Ohio Valley, the Middle-Atlantic, and New England States. Less than one-fourth the normal amounts fell in northern New England, much of western Texas, and northern Michigan. The Pacific Northwest, the Central Mountain States, Arkansas, Iowa, Missouri, Illinois, Florida, Georgia, and the Carolinas received normal amounts. Portions of the central Rockies received from two to four times the usual amounts, and it was the wettest October of record in Washington. Much of the heavy precipitation in southeastern areas accompanied the hurricane which struck Chatham County, Ga., on the 15th. Winds were estimated at 100 m. p. h. at Savannah Beach and gusts of 95 m. p. h. were recorded in Savannah. Resultant damage, mostly to buildings and communication lines, was estimated at \$2,000,000 for the county, with additional losses to timber, crops, roads, and communication lines in the environs estimated at \$250,000. Along the southern South Carolina coast, winds and high tides caused \$185,000 damage and one life was lost.

Damaging northeast winds along the Florida coast the last few days of September continued during the first 6 days of October, causing additional damage estimated at \$1,000,000. On the 8th, hail caused a total damage of \$1,800,000 in Levelland and Hockley Counties, Tex.: \$1,000,000 was to buildings, \$750,000 to crops, and \$50,000 to livestock. On the 26th, wind and hail damage combined caused over \$300,000 damage in Jacksonville, Rusk, and Cherokee Counties, Tex.

Serious drought conditions prevailed in New England during October, creating an almost unprecedented fire hazard that culminated in forest and grassland fires from the 21st through the 28th. Damage to forests and property was estimated at \$3,000,000 to \$5,000,000, and five people lost their lives.

November.—Average temperatures for November were generally 2° to 4° below normal, although they were slightly above normal in northern Michigan and a few scattered coastal areas. Warm weather during the first 3 or 4 days of the month was followed by cold weather, interrupted only by a period of warm weather in the western half of the country the last few days of the month. There were no unusual extremes.

Precipitation was distributed in four rather well-defined belts. The wettest section included the Appalachian Area, the Atlantic Coastal and South-Central States, with much of the Central and Atlantic Coastal areas receiving from two to three times the usual amounts. An adjoining dry belt extended from northern Michigan and the Ohio Valley, where some areas received less than 50 percent of normal amounts, through Missouri, Oklahoma, and central Texas. Another wet belt included most of the North-Central States and the central Rockies, extending into Idaho and eastern Oregon and southward through the Western portion of the Great Plains to the southern border, with precipitation amounts in Idaho and considerable areas in the North-Central States exceeding twice the normal. The remainder of the western portion of the country was very dry, some coastal areas receiving less than one-half their usual precipitation.

Much of the precipitation in northern areas, due to

persistently cold weather, fell as snow. South Dakota received the heaviest total snowfall of record, 15.8 inches, or 11.5 inches more than usual; near-record totals were received in surrounding States. These heavy snowfalls were often accompanied by high winds, with resultant heavy drifting that blocked secondary roads and made main-highway travel difficult. On the 6th and 7th a severe wind-, snow-, and sleet storm in Minnesota blocked roads and did \$1,200,000 damage to power and communication lines and other property; one person was killed and two injured. High winds and heavy snow delayed or stopped transportation and damaged power and communication lines severely in the eastern two-thirds of South Dakota on the 14th and 15th.

On the 6th and 7th a tornado struck Galiano, La., killing 3 people, injuring 10, and causing damage estimated at \$50,000. Eglin Field, Fla., was struck by a tornado on the 11th which injured 13 soldiers and caused \$75,000 damage. On the 12th, winds of near hurricane force, high tides, and heavy rain caused widespread damage in Nantucket, Dukes, and Barnstable Counties, Mass., totaling about \$1,000,000. A tornado on the 14th caused \$500,000 damage in and near DeRidder, La., and injured 20 persons.

December.—Temperatures averaged below normal in New England, the northern portion of the Middle Atlantic States, portions of the North-Central States and the Great Basin of the Far West; elsewhere they were above normal. The greatest average departures amounted to -4° in extreme northeastern New York and northern Vermont and $+6^{\circ}$ in northeastern Montana. The first half of the month was somewhat colder than normal, especially the second week, but seasonably warm weather prevailed

thereafter, averaging 12° to 15° above normal in portions of the North-Central States.

Precipitation was above normal in the South-Central and Southeastern States and portions of the Midwest. In the southern Great Plains, where drought conditions during the Autumn had delayed seeding and retarded growth of the winter wheat crop, this was especially beneficial. Elsewhere in the country precipitation was below normal, with numerous areas receiving less than half the usual amounts. The last half of the month was unusually dry, with precipitation entirely lacking in large areas of the Southwest. Accumulation of snow in the western mountains was lagging much below normal at the end of the month. Much-above-freezing maximum temperatures melted the snow cover over large areas of the North-Central States, leaving the wheat crop without adequate protection, and delaying the ice harvest which is normally under way during the latter part of the month.

The first cold wave of the month followed a storm of snow, sleet, and freezing rain on the 3d and 4th. Iowa was hardest hit as 1 to $1\frac{1}{2}$ inches of ice damaged power and communication lines to the extent of \$300,000. A tornado struck Navy Point, a suburb of Pensacola, Fla., on the 15th, causing \$40,000 damage and injuring 1 person.

A severe storm accompanied by high winds and heavy rain and snow was moving across the central portion of the country the last day of the month. Associated with it was a disastrous tornado which struck in a path 45 miles long through four parishes of northwestern Louisiana and was most severe in Cotton Valley. Tabulations for the tornado listed 18 people killed, 220 injured, and estimated damage of \$1,500,000.

TABLE 1.—Monthly and annual temperature departures from normal for the year 1947

State	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Alabama.....	+4.6	-6.1	-5.8	+2.5	-0.9	-0.9	-2.6	+1.4	+1.2	+5.4	-1.2	+1.4	-0.1
Arizona.....	-1.4	+3.5	+1.6	-0.1	+3.4	-1.2	+1.6	-0.6	+3.4	+1.4	-4.5	-2.7	+0.3
Arkansas.....	+1.3	-6.4	-7.5	+0.3	-1.6	-0.4	-2.2	+4.3	+1.7	+5.4	-3.6	+1.4	-0.6
California.....	-1.7	+2.1	+1.8	+1.8	+3.6	-0.7	-2.0	-1.8	+2.3	-0.3	-3.8	-1.9	-0.1
Colorado.....	-0.8	+1.3	-0.6	-0.8	+1.5	-2.9	+0.7	+1.2	+3.9	+4.1	-4.7	-0.4	+0.2
Florida.....	+7.4	-6.1	-4.1	+4.4	+0.8	-0.1	-1.5	-0.1	-0.2	+1.7	+1.9	+2.1	+0.4
Georgia.....	+4.3	-5.9	-7.3	+2.9	-0.9	-1.5	-2.8	0.0	+0.4	+3.2	-2.3	+0.3	-0.8
Idaho.....	-3.8	+4.2	+4.1	+0.1	+4.1	-3.0	+0.6	-0.9	+0.6	+2.5	-3.0	+1.7	+0.6
Illinois.....	+4.4	-5.2	-6.2	-0.4	-3.3	-2.4	-3.4	+7.3	+0.4	+7.7	-4.5	+2.7	-0.2
Indiana.....	+4.7	-6.4	-7.1	+0.1	-3.2	-2.6	-4.4	+6.1	+0.4	+7.3	-3.8	+0.4	-0.7
Iowa.....	+6.1	-4.5	-3.9	-2.0	-4.9	-3.4	-2.2	+7.9	+3.2	+9.0	-4.9	+2.2	+0.2
Kansas.....	+2.8	-1.9	-4.5	-2.3	-2.9	-2.0	-1.6	+5.2	+4.2	+8.3	-3.7	+1.2	+0.2
Kentucky.....	+4.5	-8.2	-7.8	+1.7	-3.0	-1.8	-5.4	+3.7	-0.3	+5.8	-2.3	0.0	-1.0
Louisiana.....	-0.6	-7.3	-6.5	+1.2	-0.1	+0.5	-0.7	+1.4	+1.3	+4.8	-1.7	+0.1	0.0
Maryland-Delaware.....	+6.5	-3.6	-5.5	+2.3	-0.2	-1.3	-1.9	+2.8	+0.2	+5.5	-1.8	-0.5	+0.2
Michigan.....	+2.9	-1.6	-2.8	-2.2	-4.6	-2.7	-1.5	+6.8	+1.3	+8.8	-2.7	-0.1	+0.2
Minnesota.....	+7.1	-2.4	-1.9	-3.8	-4.6	-3.5	+0.2	+6.0	0.0	+8.7	-5.2	-1.7	-0.1
Mississippi.....	+1.3	-7.4	-6.9	+1.1	-1.1	-0.4	-2.5	+2.1	+1.4	+5.1	-2.0	+0.3	-0.1
Missouri.....	+4.0	-4.5	-6.7	-0.1	-2.1	-1.0	-3.0	+6.8	+2.6	+7.2	-3.4	+3.5	+0.2
Montana.....	+1.6	+0.3	-1.7	-0.1	+1.1	-3.2	+1.9	+0.4	-0.1	+3.9	-3.6	+2.9	+0.3
Nebraska.....	+5.2	-2.1	-2.7	-2.4	-2.5	-3.8	-1.2	+6.0	+2.7	+7.7	-4.3	+1.5	+0.3
Nevada.....	-0.3	+7.1	+4.2	+1.6	+5.9	-1.1	-0.6	-0.5	+3.6	+2.4	-4.0	+0.2	+1.5
New England.....	+2.4	+0.7	-0.3	-1.4	-1.4	-1.9	+2.1	+3.2	+0.6	+6.0	-2.1	-3.1	+0.4
New Jersey.....	+5.9	-2.5	-2.9	+0.7	-0.5	-1.5	-0.1	+2.7	+1.1	+5.7	-1.9	-1.6	+0.4
New Mexico.....	-2.7	+1.1	-0.6	-1.2	+2.0	-0.1	+1.9	+0.3	+2.6	+3.5	-4.3	-1.5	0.0
New York.....	+4.3	-1.9	-2.1	-0.7	-1.1	-1.9	+0.1	+4.7	+1.1	+6.9	-2.3	-2.4	+0.4
North Carolina.....	+5.2	-6.4	-7.6	+2.9	+0.3	+1.3	-3.0	+1.3	+0.3	+3.7	-2.2	-0.8	-0.6
North Dakota.....	+9.0	-1.1	-1.7	-1.7	-3.5	-3.2	+1.4	+4.3	-1.2	+7.0	-4.1	+0.8	+0.5
Ohio.....	+5.9	-6.3	-5.9	+0.9	-2.7	-1.9	-4.2	+5.6	+0.5	+7.5	-2.3	0.0	-0.2
Oklahoma.....	+0.4	-3.5	-5.5	-1.4	-1.8	+0.2	-1.6	+3.5	+3.1	+6.9	-3.8	+1.5	-0.1
Oregon.....	-2.4	+4.3	+2.9	+1.1	+4.4	-2.6	-1.7	-2.2	+1.4	+1.2	-1.2	+1.1	+0.5
Pennsylvania.....	+5.3	-5.1	-5.9	+0.5	-2.0	-2.1	-2.6	+3.7	0.0	+5.9	-3.0	-1.0	-0.5
South Carolina.....	+4.2	-6.2	-7.9	+3.0	+0.1	-1.5	-3.2	+0.1	+0.3	+3.3	-2.7	-0.6	-0.9
South Dakota.....	+7.4	-1.9	-3.3	-2.8	-2.8	-3.7	-0.1	+6.0	+1.2	+7.4	-5.8	+1.2	+0.2
Tennessee.....	+4.1	-8.5	-8.4	+1.9	-2.2	-0.8	-4.0	+3.7	+1.2	+6.0	-1.7	+0.4	-0.7
Texas.....	-2.6	-5.8	-5.4	-0.6	-0.4	+0.8	+0.3	+0.2	+1.4	+5.7	-3.0	+1.2	-0.7
Utah.....	-3.3	+4.9	+3.2	-0.9	+3.8	-3.6	0.0	-0.4	+2.2	+3.2	-5.3	-0.5	+0.3
Virginia.....	+5.7	-6.2	-8.1	+1.9	0.0	-1.7	-2.9	+2.3	0.0	+4.4	-1.3	-1.1	-0.6
Washington.....	-2.0	+3.6	+2.7	+1.3	+4.4	-0.8	-0.8	-1.8	+0.9	0.0	-0.1	+2.0	+0.8
West Virginia.....	+6.3	-7.8	-8.3	+3.8	-1.6	-1.5	-3.9	+4.0	+0.3	+5.8	-1.3	-0.7	-0.4
Wisconsin.....	+5.4	-1.9	-1.8	-2.2	-4.5	-3.0	-0.9	+7.2	+1.5	+9.3	-4.4	+0.5	+0.4
Wyoming.....	+0.6	+0.7	+0.5	-0.3	+2.1	-3.7	+1.9	+2.6	+3.0	+5.9	-5.8	+2.1	+0.8

TABLE 2.—Percentage of normal precipitation, 1947

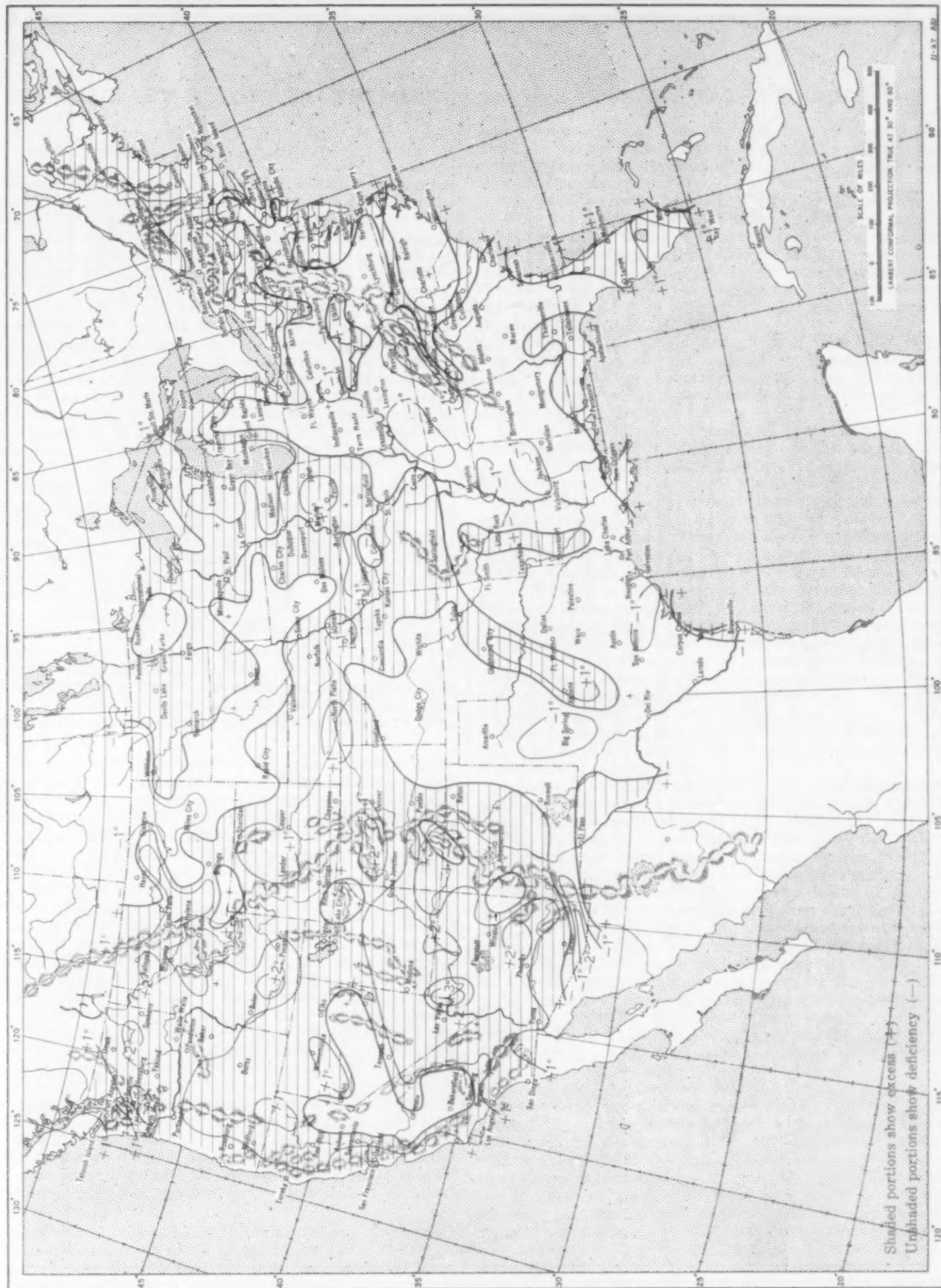
State	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Alabama.....	208	38	124	147	150	111	62	77	78	62	252	90	114
Arizona.....	27	22	12	6	209	32	45	133	53	124	92	98	80
Arkansas.....	55	22	61	114	109	95	34	62	97	117	131	99	84
California.....	21	44	87	40	49	234	138	170	23	229	36	38	87
Colorado.....	78	86	73	86	150	184	83	121	79	156	92	101	110
Florida.....	91	116	209	172	121	128	109	101	155	165	264	101	137
Georgia.....	172	33	137	135	124	118	82	95	93	169	297	124	119
Idaho.....	75	00	97	82	84	189	28	97	141	182	105	71	101
Illinois.....	96	10	77	177	104	157	59	65	96	119	91	101	102
Indiana.....	128	14	58	193	126	132	94	103	120	84	65	61	102
Iowa.....	134	29	78	186	104	221	47	41	55	161	115	123	111
Kansas.....	83	33	167	172	118	129	62	58	49	65	92	229	102
Kentucky.....	139	16	50	122	142	111	92	105	105	84	83	45	92
Louisiana.....	168	46	170	146	111	97	33	67	102	57	238	125	112
Maryland-Delaware.....	119	55	47	81	150	121	98	73	81	50	206	53	94
Michigan.....	109	83	82	203	148	94	90	91	140	40	98	84	108
Minnesota.....	73	49	56	180	73	127	57	111	100	88	197	73	100
Mississippi.....	190	34	104	161	124	110	44	65	113	74	206	88	109
Missouri.....	57	12	87	166	91	171	62	48	95	122	98	84	98
Montana.....	84	96	98	88	47	152	60	182	136	122	121	72	106
Nebraska.....	110	33	55	115	86	219	59	37	83	82	196	218	103
Nevada.....	22	43	32	82	120	77	10	59	46	102	90	81	64
New England.....	95	81	89	107	141	127	128	56	73	39	144	76	96
New Jersey.....	102	57	71	120	199	97	92	81	71	57	202	81	101
New Mexico.....	86	36	51	47	145	48	54	121	28	61	105	127	76
New York.....	135	62	107	135	178	130	149	68	80	60	140	82	110
North Carolina.....	165	32	84	96	67	104	83	89	140	165	229	58	103
North Dakota.....	74	87	43	104	49	165	74	128	92	130	172	89	106
Ohio.....	159	24	49	165	154	140	100	130	115	66	84	60	108
Oklahoma.....	51	13	70	193	143	94	72	40	64	64	103	135	95
Oregon.....	75	55	111	93	49	246	238	95	73	299	83	66	98
Pennsylvania.....	117	50	65	113	159	97	145	93	69	41	146	49	98
South Carolina.....	141	20	131	134	87	97	91	99	116	156	308	126	116
South Dakota.....	96	52	57	111	44	172	42	49	76	15	268	33	93
Tennessee.....	169	36	59	95	125	86	79	78	64	96	122	57	89
Texas.....	142	33	119	78	136	73	87	128	40	47	126	121	89
Utah.....	78	64	65	134	136	329	39	204	89	152	159	127	124
Virginia.....	154	52	66	76	90	105	84	92	133	100	187	41	96
Washington.....	107	87	72	102	30	181	167	57	110	246	84	88	106
West Virginia.....	129	53	58	60	89	85	97	114	119	52	110	42	85
Wisconsin.....	98	27	67	155	107	108	80	108	101	66	116	78	98
Wyoming.....	79	84	79	101	116	239	75	102	98	110	154	72	117

TABLE 3.—Monthly and annual precipitation (inches), 1947

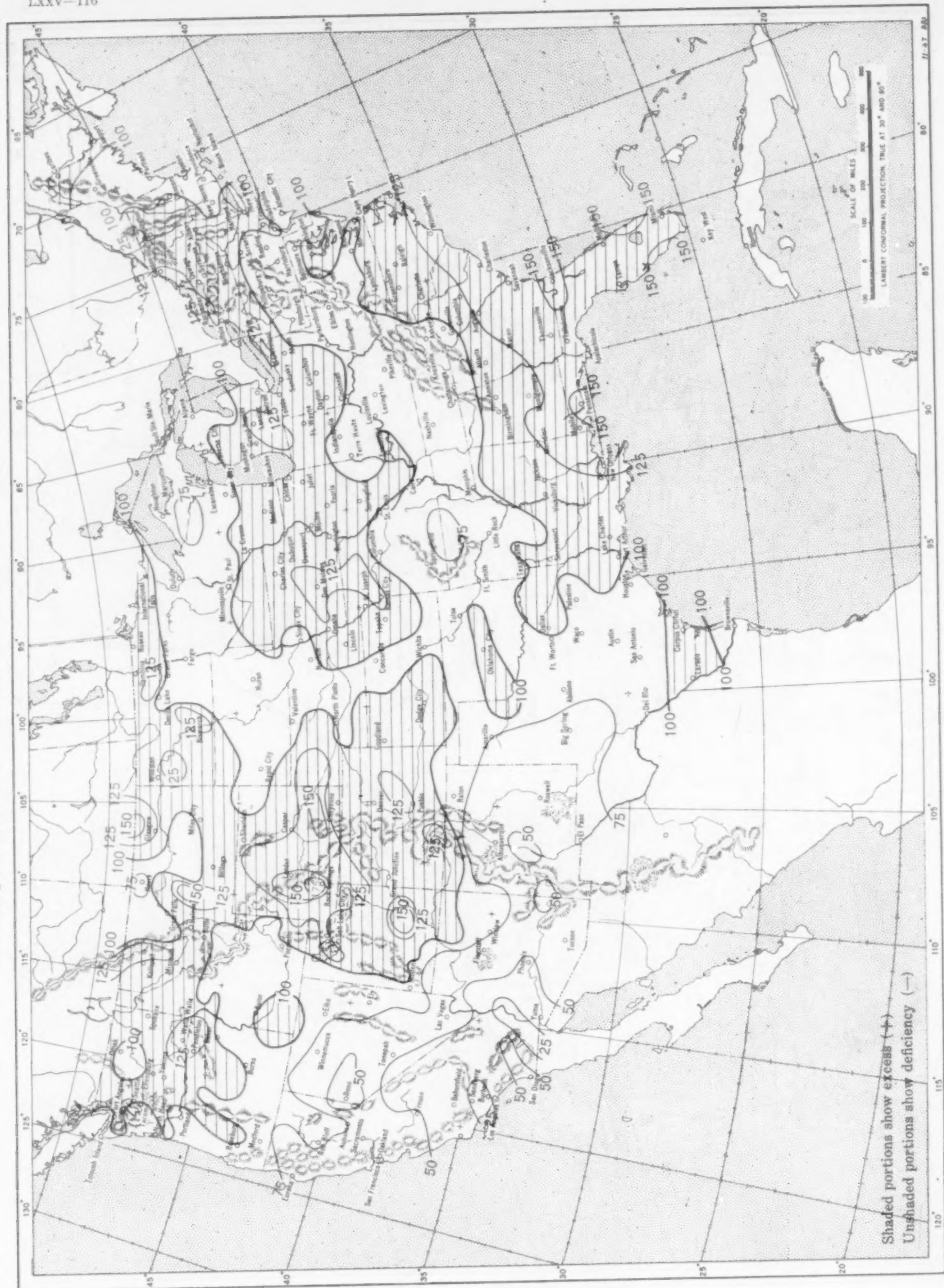
State	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Alabama.....	10.07	1.98	7.13	6.82	5.93	4.70	3.48	3.68	2.61	1.80	8.09	4.77	61.06
Arizona.....	0.35	0.28	0.13	0.04	0.67	0.11	0.94	3.12	0.71	1.08	0.88	1.26	9.57
Arkansas.....	2.33	0.78	2.09	5.74	5.50	3.88	1.25	2.20	3.28	3.72	5.06	4.17	40.60
California.....	0.98	2.01	3.21	0.67	0.46	0.75	0.11	0.17	0.10	2.89	0.88	1.50	13.73
Colorado.....	0.62	0.83	0.97	1.55	2.85	2.63	1.75	2.38	1.07	1.89	0.72	0.89	18.15
Florida.....	2.51	3.56	6.84	5.05	4.80	8.75	8.11	7.08	10.48	6.88	5.84	2.80	72.70
Georgia.....	7.44	1.60	6.87	5.22	4.29	5.22	2.97	4.95	3.37	4.53	7.92	8.30	59.68
Idaho.....	1.60	1.04	1.72	1.17	1.40	2.67	0.18	0.61	1.52	2.78	2.21	1.46	18.36
Illinois.....	2.21	0.19	2.45	6.42	4.32	6.31	1.88	2.21	3.53	3.13	2.40	2.13	37.18
Indiana.....	3.80	0.34	2.17	7.03	5.17	5.21	3.12	3.44	3.98	2.80	1.98	1.66	40.20
Iowa.....	1.46	0.31	1.38	5.06	4.26	10.40	1.72	1.40	2.10	3.75	1.84	1.46	35.23
Kansas.....	0.58	0.32	2.47	4.67	4.50	5.20	1.91	1.84	1.40	1.29	1.17	2.08	27.43
Kentucky.....	6.04	0.54	2.36	4.94	5.66	4.74	3.82	3.89	3.04	2.20	2.82	1.79	41.74
Louisiana.....	8.53	2.07	8.30	6.86	5.28	4.61	2.02	3.45	4.14	1.83	0.98	6.66	63.33
Maryland-Delaware.....	3.95	1.61	1.70	2.81	5.38	4.39	4.29	3.26	3.01	1.52	5.43	1.66	39.01
Michigan.....	2.13	1.41	1.71	4.85	4.91	2.95	2.68	2.82	4.48	1.08	2.41	1.71	32.84
Minnesota.....	0.54	0.37	0.68	3.40	2.37	5.28	1.85	3.66	2.87	1.61	2.33	0.55	25.51
Mississippi.....	9.78	1.68	6.08	7.89	5.37	4.63	2.21	2.68	3.48	1.80	7.72	4.62	57.94
Missouri.....	1.30	0.26	2.80	6.78	4.38	8.19	2.17	1.81	3.83	3.83	2.65	1.82	39.82
Montana.....	0.76	0.72	0.96	0.99	0.97	3.95	0.81	1.98	1.88	1.33	1.26	0.68	16.29
Nebraska.....	0.58	0.23	0.61	2.76	2.91	8.19	1.81	0.98	1.71	1.19	1.51	0.87	23.35
Nevada.....	0.26	0.46	0.32	0.65	1.02	0.40	0.04	0.29	0.19	0.66	0.69	0.79	5.77
New England.....	3.24	2.48	3.23	3.57	4.85	4.50	4.84	2.10	2.77	1.36	5.12	2.52	40.58
New Jersey.....	3.71	1.97	2.71	4.33	7.22	3.71	4.27	3.83	2.68	2.06	6.57	2.85	45.91
New Mexico.....	0.51	0.25	0.38	0.42	1.77	0.59	1.31	2.98	0.48	0.71	0.67	0.90	10.97
New York.....	3.89	1.63	3.27	4.08	6.33	4.76	5.90	2.42	2.80	1.34	4.28	2.39	43.09
North Carolina.....	2.44	2.70	0.68	0.14	1.31	0.20	1.01	0.60	1.61	2.03	3.47	1.60	17.79
North Dakota.....	0.35	0.40	0.34	1.48	1.11	5.81	1.79	2.67	1.45	1.31	1.05	0.42	18.18
Ohio.....	4.74	0.62	1.68	5.31	5.82	5.55	3.79	4.39	3.37	1.67	2.27	1.61	40.82
Oklahoma.....	0.73	0.19	1.53	6.87	6.83	3.71	1.99	1.17	2.04	1.90	2.12	2.33	31.41
Oregon.....	2.83	1.75	3.04	1.84	0.86	3.27	1.00	0.40	0.86	5.38	3.11	2.55	26.89
Pennsylvania.....	3.65	1.39	2.27	3.86	6.36	4.04	6.23	3.85	2.35	1.34	4.22	1.50	41.06
South Carolina.....	5.06	0.84	5.26	4.38	3.03	4.54	5.37	5.62	4.76	4.53	7.35	4.56	55.30
South Dakota.....	0.53	0.29	0.64	2.29	1.25	6.24	1.00	1.03	1.18	1.83	1.74	0.17	18.19
Tennessee.....	8.21	1.60	3.15	4.17	5.18	3.56	3.54	3.12	1.96	2.70	4.38	2.55	44.12
Texas.....	2.57	0.58	2.37	2.28	5.05	2.17	0.98	3.04	1.11	1.24	2.68	2.81	26.88
Utah.....	0.95	0.82	0.93	1.68	1.64	2.30	0.35	2.18	0.90	1.83	1.61	1.44	16.63
Virginia.....	5.04	1.59	2.39	2.47	3.34	4.36	3.93	4.05	4.31	2.97	4.60	1.25	40.30
Washington.....	5.02	3.18	2.43	2.51	0.59	3.01	1.10	0.47	1.87	7.39	3.71	4.99	36.27
West Virginia.....	4.59	1.64	2.27	2.11	3.57	3.80	4.46	4.65	3.52	1.48	3.03	1.36	36.48
Wisconsin.....	1.22	0.32	1.17	3.91	3.93	4.55	2.73	3.63	3.75	1.57	2.21	1.00	29.99
Wyoming.....	0.62	0.65	0.90	1.63	2.42	4.21	0.98	1.07	1.14	1.21	1.36	0.51	16.70

No.		Date		Particulars		Debit		Credit		Balance	
1		1880	Jan 1	Balance forward							
2		1880	Jan 15	By Cash							
3		1880	Jan 20	To Cash							
4		1880	Jan 25	By Cash							
5		1880	Jan 30	To Cash							
6		1880	Feb 5	By Cash							
7		1880	Feb 10	To Cash							
8		1880	Feb 15	By Cash							
9		1880	Feb 20	To Cash							
10		1880	Feb 25	By Cash							
11		1880	Feb 28	To Cash							
12		1880	Mar 5	By Cash							
13		1880	Mar 10	To Cash							
14		1880	Mar 15	By Cash							
15		1880	Mar 20	To Cash							
16		1880	Mar 25	By Cash							
17		1880	Mar 30	To Cash							
18		1880	Apr 5	By Cash							
19		1880	Apr 10	To Cash							
20		1880	Apr 15	By Cash							
21		1880	Apr 20	To Cash							
22		1880	Apr 25	By Cash							
23		1880	Apr 30	To Cash							
24		1880	May 5	By Cash							
25		1880	May 10	To Cash							
26		1880	May 15	By Cash							
27		1880	May 20	To Cash							
28		1880	May 25	By Cash							
29		1880	May 30	To Cash							
30		1880	Jun 5	By Cash							
31		1880	Jun 10	To Cash							
32		1880	Jun 15	By Cash							
33		1880	Jun 20	To Cash							
34		1880	Jun 25	By Cash							
35		1880	Jun 30	To Cash							
36		1880	Jul 5	By Cash							
37		1880	Jul 10	To Cash							
38		1880	Jul 15	By Cash							
39		1880	Jul 20	To Cash							
40		1880	Jul 25	By Cash							
41		1880	Jul 30	To Cash							
42		1880	Aug 5	By Cash							
43		1880	Aug 10	To Cash							
44		1880	Aug 15	By Cash							
45		1880	Aug 20	To Cash							
46		1880	Aug 25	By Cash							
47		1880	Aug 30	To Cash							
48		1880	Sep 5	By Cash							
49		1880	Sep 10	To Cash							
50		1880	Sep 15	By Cash							
51		1880	Sep 20	To Cash							
52		1880	Sep 25	By Cash							
53		1880	Sep 30	To Cash							
54		1880	Oct 5	By Cash							
55		1880	Oct 10	To Cash							
56		1880	Oct 15	By Cash							
57		1880	Oct 20	To Cash							
58		1880	Oct 25	By Cash							
59		1880	Oct 30	To Cash							
60		1880	Nov 5	By Cash							
61		1880	Nov 10	To Cash							
62		1880	Nov 15	By Cash							
63		1880	Nov 20	To Cash							
64		1880	Nov 25	By Cash							
65		1880	Nov 30	To Cash							
66		1880	Dec 5	By Cash							
67		1880	Dec 10	To Cash							
68		1880	Dec 15	By Cash							
69		1880	Dec 20	To Cash							
70		1880	Dec 25	By Cash							
71		1880	Dec 30	To Cash							
72		1880	Total								

Annual Temperature Departures (°F.) in the United States, 1947



Percentage of Normal Annual Precipitation in the United States, 1947



PRELIMINARY REPORT ON TORNADOES IN THE UNITED STATES DURING 1947

L. V. WOLFORD

[Weather Bureau, Washington, D. C.]

During 1947, 161 tornadoes were reported in the United States, which is 20 more than the annual average for the period 1916 through 1946. June brought the largest number, with 33 occurring during the month. May, the month in which the greatest number usually occurs, was second in the listing, with 27; April was third with 26. Tornadoes occurred during every month of the year except February, but in only 28 States. Six of the storms crossed State boundaries. Of the 161 storms, 25 were reported from Florida; 19 from Kansas; 16 from Missouri; 12 each from Texas and Oklahoma; and 1 each from 8 other States. Although the greatest number occurred in Florida, none were unusually destructive, and many were associated with hurricanes. Most disastrous was the tornado of September 19, at Apalachicola, in which 2 persons lost their lives, 15 were injured, and estimated property damage of \$250,000 occurred.

During the year there were 306 deaths from tornadoes, which is 73 more than the average annual toll. In only 9 years since 1916 has this number been exceeded. The greatest loss of human life took place in April when 196 were killed: 101 deaths occurred in Oklahoma and 66 in Texas when the disastrous tornado of April 9, swept through these States and Kansas.

Property damage for the year was approximately \$24,013,400, nearly double the amount of the yearly average. About one-half of it occurred during the month of April. Oklahoma stood highest, with losses for the year amounting to over \$9,000,000; followed by Louisiana, with \$2,201,900; and Texas, with \$1,908,800. Arkansas, Missouri, and Pennsylvania each suffered a little over \$1,000,000 loss.

The most violent tornado of the year appeared to be that of April 9, which swept across Texas, Oklahoma, and Kansas: 167 persons lost their lives, and property damage was estimated at nearly \$10,000,000. This is considered the longest, widest, and most destructive tornado ever to have occurred in that section of the country. The storm moved in a 221-mile path from White Deer, Tex., northeastward to St. Leo, Kans. It followed a northeasterly path of 101 miles in Oklahoma, entering Ellis County about 8 p. m., after demolishing Higgins, Tex. From Ellis County it moved into Woodward County, striking the town of Woodward, Okla., at 8:43 p. m., and destroying much of the northwestern half of the city. Since Woodward was the largest city in the tornado path, it suffered the greatest losses, with the death of 95 persons, injuries to 723, and property damage of about \$6,000,000. Continuing through Woodward and Woods Counties, the storm left Oklahoma and crossed the Kansas line at 10 p. m., west of Hardtner. One hundred and one persons lost their lives in the 3 counties of Oklahoma, 782 persons were injured, and property damage was estimated to be \$8,022,750. Along the path in Texas, 66 persons were killed, 201 were injured, and property damage of \$1,505,000 occurred. The path of the storm in Kansas was 40 miles long; \$200,000 worth of property was damaged, but there was no loss of life.

On May 31, a second tornado followed much the same path as the disastrous storm of April 9, in Texas and Oklahoma. It originated about 6:45 p. m., as a small tornado,

and struck Higgins, Tex., moving from the southwest to Ellis County, Okla. Due to the extensive destruction resulting from the previous storm, further damage from this one was negligible.

Still another very destructive tornado hit Oklahoma on May 31. It originated 15 miles southwest of Leedey in Roger Mills County. Fatalities, injuries, and the principal property damage were in Leedey, where 147 residences and 20 business places—comprising about three-fourths of the town—were demolished. Six persons lost their lives and 15 were injured, and property damage was reported at about \$1,000,000.

The agricultural section just south of Pine Bluff, Ark., was visited by a violent tornado on the afternoon of June 1. The toll of the twister was 35 killed, 300 injured, 500 homeless; and final estimates placed the property damage near \$1,000,000.

During June another tornado of great intensity first struck in Trumbull County, Ohio, on the 7th at 2:28 p. m. Three deaths occurred in the State and approximately 40 persons were injured. Estimated property losses were near \$100,000. Far greater destruction was wrought by this same tornado in the city of Sharon, Pa., very close to the Ohio line, where more than a million dollars worth of property was damaged in the storm's passage across Mercer County. The towns of Sharon, Mercer, and Grove City were chiefly affected, the greatest toll being in Sharon where, in addition to 3 fatalities, more than 300 persons were injured, 51 of them requiring hospitalization.

On December 2, a small tornado occurred at Phoenix, Ariz. This was an unusual phenomenon for Arizona, as only two such storms had been reported from that State during the entire period of 1916 through 1946. Two steel trailers, weighing 2,500 pounds each, were turned around and one turned over, and 500 feet of lumber were pulverized into kindling wood. The funnel cloud was clearly observed and photographed.

A series of tornadoes occurred in Arkansas, Mississippi, and Louisiana as the year declined, although some of these struck after midnight on December 31 and are not included in this year's toll. The most destructive of this series moved northeastward across Bossier, Webster, and the northwest corner of Claiborne Parishes, La. Apparently the tornado entered the town of Cotton Valley from the west, crossed it, and then turned abruptly around. By-passing the community on a westward track, and looping, it struck the business district again from the southwest. Fourteen fatalities were reported, as well as 200 injuries, and about one-fourth of the town was totally destroyed or damaged to the extent that complete rebuilding will be necessary. Next hardest hit was Haynesville, in Claiborne Parish, La., where 4 deaths and 20 injuries resulted. The total damage in the State was estimated at \$1,500,000.

The tabulations for 1947 are shown in Table 1, which follows. They are derived from data on "Severe Local Storms" appearing in the MONTHLY WEATHER REVIEW and in the CLIMATOLOGICAL DATA publications for the different Sections of the United States. The listing shows the approximate monthly and annual number of tornadoes, the number of resultant deaths and injuries, and the property damage caused in the several States and the country as a whole. A final and more complete report will appear in the UNITED STATES METEOROLOGICAL YEARBOOK for 1947.

TABLE 1.—Tornadoes and probable tornadoes

State*	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Alabama:													
Number	3												3
Deaths	6												6
Injuries	40												40
Damage (\$×1,000)	185.8												185.8
Arizona:													
Number												1	1
Deaths												0	0
Injuries												0	0
Damage (\$×1,000)												(¹)	(¹)
Arkansas:													
Number	1			1		1						3	6
Deaths	1			9		35						2	47
Injuries	12			50		300						101	463
Damage (\$×1,000)	168.5			200.0		1,000.0						214.0	1,582.5
Colorado:													
Number						3							3
Deaths						0							0
Injuries						3							3
Damage (\$×1,000)						810.0							810.0
Florida:													
Number			1		1	1	1		11	5	4	1	25
Deaths			0		0	0	0		2	0	0	0	2
Injuries			0		0	0	0		16	10	21	1	48
Damage (\$×1,000)			15.0		0	0.5	(¹)		276.5	\$ 100.0	200.5	40.0	\$ 632.5
Georgia:													
Number	3			2	1						1		7
Deaths	0			0	0						0		0
Injuries	23			6	0						0		29
Damage (\$×1,000)	240.0			100.0	4.5						0.6		345.1
Illinois:													
Number				2		1							3
Deaths				0		0							0
Injuries				0		0							0
Damage (\$×1,000)				(¹)		200.0							\$ 200.0
Indiana:													
Number	2				1		2						5
Deaths	0				0		0						0
Injuries	0				0		0						0
Damage (\$×1,000)	260.0				5.0		200.0						465.0
Iowa:													
Number				1		5							6
Deaths				0		1							1
Injuries				0		2							2
Damage (\$×1,000)				100.0		\$ 310.0							\$ 410.0
Kansas:													
Number				6	5	5	2			1			19
Deaths				0	0	1	0			0			1
Injuries				6	0	4	0			0			10
Damage (\$×1,000)				530.0	261.0	71.0	40.0			0.5			902.5
Louisiana:													
Number	1		1	1							5	1	9
Deaths	0		2	0							4	18	24
Injuries	0		0	0							32	220	262
Damage (\$×1,000)	1.2		100.0	1.7							599.0	1,500.0	2,201.9
Massachusetts:													
Number							1						1
Deaths							0						1
Injuries							0						0
Damage (\$×1,000)							(¹)						(¹)
Minnesota:													
Number						1	1	1					3
Deaths						1	2	1					4
Injuries						2	7	8					17
Damage (\$×1,000)						625.00	80.0	142.5					847.5
Mississippi:													
Number							2						2
Deaths							0						0
Injuries							0						0
Damage (\$×1,000)							18.0						18.0
Missouri:													
Number	4			4	1	5			2				16
Deaths	6			15	0	1			0				22
Injuries	25			51	0	6			0				82
Damage (\$×1,000)	20.0			1,005.0	(¹)	200.0			\$ 10.0				\$ 1,235.0
Montana:													
Number							2						3
Deaths							0						0
Injuries							0						0
Damage (\$×1,000)							\$ 14.8	350.0					\$ 364.8
Nebraska:													
Number						8							8
Deaths						0							0
Injuries						8							8
Damage (\$×1,000)						\$ 175.0							\$ 175.0
New Mexico:													
Number					1								1
Deaths					0								0
Injuries					0								0
Damage (\$×1,000)					0								0
New York:													
Number							1						1
Deaths							0						0
Injuries							0						0
Damage (\$×1,000)							5.0						5.0
North Carolina:													
Number				1									1
Deaths				1									1
Injuries				4									4
Damage (\$×1,000)				150.0									150.0
North Dakota:													
Number							1						1
Deaths							8						8
Injuries							23						23
Damage (\$×1,000)							200.0						200.0

See footnotes at end of table.

TABLE 1.—Tornadoes and probable tornadoes—Continued

State*	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Ohio:													
Number	1				4	1			2				8
Deaths	0				0	3			0				3
Injuries	0				18	40			0				58
Damage (\$×1,000)	250.0				115.0	100.0			50.0				515.0
Oklahoma:													
Number				6	5	1							12
Deaths				105	6	0							111
Injuries				785	27	0							812
Damage (\$×1,000)				8,090.5	1,264.5	4.0							9,359.0
Pennsylvania:													
Number				4	1				1				6
Deaths				2	3				2				7
Injuries				0	304				20				324
Damage (\$×1,000)				100.0	1,000.0				100.0				1,200.0
South Carolina:													
Number				1									1
Deaths				0									0
Injuries				0									0
Damage (\$×1,000)				5.0									5.0
Tennessee:													
Number	1												1
Deaths	1												1
Injuries	5												5
Damage (\$×1,000)	(1)												(1)
Texas:													
Number				4	4	1				1	2		12
Deaths				66	1	0				0	0		67
Injuries				210	17	0				0	6		233
Damage (\$×1,000)				1,537.6	250.0	0.2				100.0	21.0		1,908.8
Virginia:													
Number				1			2	1					4
Deaths				0			1	0					1
Injuries				2			0	0					2
Damage (\$×1,000)				15.0			280.0	(1)					295.0
United States:													
Number	115	0	2	126	127	133	114	3	16	7	12	6	1161
Deaths	14	0	2	196	9	45	11	1	4	0	4	20	306
Injuries	105	0	0	1,112	64	669	30	8	36	10	59	322	2,415
Damage (\$×1,000)	1,125.5	0	115.0	11,719.8	2,015.0	4,495.7	837.8	492.5	436.5	200.5	821.1	1,754.0	24,013.4

*None reported for States not listed.

†Corrected for boundary-crossing tornadoes.

‡Considerable.

§ Additional losses.

¶ Not reported.

NORTH ATLANTIC HURRICANES AND TROPICAL DISTURBANCES OF 1947

H. C. SUMNER

[Weather Bureau, Washington, D. C.]

Viewed from the standpoint of property damage, with losses estimated at about \$135,000,000, the hurricane season of 1947 must be listed among the most destructive in the records of the Hurricane Warning Service, established in 1873. In a year of very severe hurricanes which passed over heavily populated coastal areas, the loss of only 53 lives in the United States sustained the annual record of less than 4 fatalities for each \$10,000,000 in property damage, a record which had been maintained for the 6 previous seasons. Casualties now number less than 3 percent of the proportional loss of 20 years ago; it is believed that a large contributing factor toward this reduction in casualties has been the maintenance of an adequate hurricane warning service and mass evacuations of the population from exposed and low-lying areas.

During the past season, 10 tropical storms were detected, 5 of which developed hurricane or near-hurricane-force winds. The most intense was that of September 10-19 (No. VI), which crossed the southern portion of the Florida Peninsula on the 17th, traversed the eastern Gulf of Mexico, and moved inland on the Louisiana and Mississippi coasts on the morning of the 19th, with the center passing directly over the business section of New Orleans. This hurricane took a toll of 51 lives in Florida, Louisiana, and Mississippi, with total property damage estimated at \$110,000,000.

On October 15 another severe hurricane (No. IX), moving on a westerly course, passed inland over the Georgia coast a short distance south of Savannah. When hurricane warnings were ordered, hundreds of persons were evacuated from the beaches. Since high tides along the Georgia and South Carolina coasts ranged from 12.0 feet above mean low tide at Savannah Beach, Ga., to 9.0 feet above at Charleston, S. C., these mass evacuations were largely responsible for the absence of fatalities along the beaches.

Of the three other severe North Atlantic tropical storms of 1947, only one reached the coast line of the United States. This August storm (No. III) moved inland over Galveston, Tex., accompanied by winds of near-hurricane force which wrought damage of about \$200,000.

For the entire season a record number of 159 official warnings and advisories were issued from the hurricane forecast centers of the Weather Bureau.

The following are reviews of all North Atlantic hurricanes and tropical disturbances that occurred during the 1947 season. A synopsis of the important features of these storms is given in Table 2; their tracks, numbered I to X, chronologically, are plotted on the Chart following this article.

I. Minor tropical disturbance of July 31-August 1.—A weak tropical disturbance formed in the southwest Gulf of Mexico on July 31, moved westward and then north-northwestward across the western Gulf of Mexico, and passed inland on the Gulf Coast a short distance south of Brownsville, Tex. The strongest wind reported was 44 m. p. h., at Port Isabel, Tex.

Heavy rains caused some damage to the cotton crop. Early estimates mentioned a loss of about \$2,000,000, but subsequent reports indicated that improved moisture conditions for ranges, late feed crops, citrus fruit, and

fall vegetables had more than offset damage to the cotton crop. Among the recorded heavy amounts of precipitation which fell in Texas during passage of this storm are: Corpus Christi, 3.28 inches; Raymondville, 9.78 inches; Falfurrias, 8.11 inches; and Brownsville, 4.41 inches. No loss of life or injury was reported.

II. Hurricane of August 12-15.—On August 12 a tropical storm formed over the northwestern Caribbean Sea, moved on a westerly course over the Yucatan Peninsula, and after developing hurricane force winds while passing over the southern Gulf of Mexico, moved inland on the Mexican east coast a short distance south of Tampico. On the morning of August 15, winds as high as 110 m. p. h. were reported in that city. There were 19 deaths from this hurricane, one in Tampico and 18 in the oil fields to the south.

III. Tropical disturbance of August 18-27.—This disturbance formed in an easterly wave that moved westward through the Florida Straits on August 18. By the morning of the 19th a circulation had formed some 150 miles west-southwest of Key West, Fla. During this stage of development the highest wind reported was about 45 m. p. h. in squalls at some points along the Florida Keys. The disturbance moved slowly westward to the middle Gulf, where on the 21st it was so weak that its path could not be followed with certainty. Subsequently, it redeveloped and moved into Texas in the vicinity of Galveston on the 24th, as a storm of small diameter accompanied by winds of near-hurricane force.

The lowest observed pressure, 992.2 mb. (29.30 inches), reported by the Galveston office, occurred at 4:45 p. m. There was little evidence of a storm tide until shortly before the approach of the center: the rise of 0.6 foot, from 3.4 to 4.0 feet, took place on August 24 between 3 and 4 p. m. The tide reading was recorded on the U. S. Engineer staff gage located at the entrance of Galveston Channel.

Total damage from the storm was estimated at \$200,000. In the city of Galveston it was confined mainly to roofs, signs, plate glass, and the interiors of dwellings, for the most part caused by wind-driven rain. In Galveston County, outside the city, property damage was estimated at \$150,000 and crop damage at \$32,500, of which \$25,000 was loss to the rice crop. One man was electrocuted in Galveston while trying to move a live wire that had fallen to the ground.

IV. Tropical disturbance of August 21-22.—On the afternoon of August 21, the center of a weak tropical disturbance was located by reconnaissance planes about 75 miles south-southeast of Burrwood, La. This center moved west-northwestward and passed inland on the Louisiana coast just west of Grand Isle. The strongest wind reported was 44 m. p. h., at Grand Isle.

V. Minor tropical disturbance of September 7-8.—During the afternoon of September 7 a small tropical storm formed over the northeast Gulf of Mexico. Moving northwestward, it passed over the Gulf coast between Mobile, Ala., and Biloxi, Miss., on the following afternoon. Gusts of 45 m. p. h. were reported at Mobile and 51 m. p. h. at Pensacola, Fla. Two ships went aground in Mobile Bay during the morning of September 8, but were refloated early in the afternoon. No other damage was reported.

VI. *Major hurricane of September 10-19.*—The first indication that a well-developed tropical storm had formed over the Atlantic came in a report from the S. S. *Arakaka*, radioed during the night of September 10 from a position near latitude 15° N., longitude 49° W. Prior to this, however, the Pan American Airways station at Dakar, F. W. A., had reported that a low pressure area had developed over French West Africa on September 2 and had moved westward across the coast line. Over the water this depression deepened, and on September 4 gave Dakar 3.36 inches of rain. This circulation was traced until it reached the Cape Verde Islands on September 5 but was subsequently lost through a lack of ship observations. Since an average progressive westward movement of about 17 m. p. h. for the next 5 days would have brought this disturbance near the storm position first reported by the *Arakaka*, it seems probable that the ship was reporting the same storm and that this great September hurricane had its genesis over western Africa.

OVER FLORIDA

From the time of the storm's detection on September 10, reconnaissance planes of the Army and Navy followed it on a west-northwesterly course until it reached a position east of Abaco Island in the Bahamas on the 15th. Here it came to a virtual standstill for about 24 hours and then moved west-southwestward over that island and on to the Florida east coast at Fort Lauderdale on the 17th. Hopetown, on Abaco Island, recorded a highest wind speed of 160 m. p. h. when the center passed near the observatory.

The highest wind recorded by a reliable instrument in Florida was 155 m. p. h., at Hillsboro Light near Pompano at 12:56 p. m. on the 17th, at which time the lowest reliable pressure reading of 947.2 mb. (27.97 inches) was also recorded. Winds of 100 m. p. h. or over were experienced generally along the Florida east coast from the northern portion of Miami to well north of Palm Beach, a distance of about 70 miles, while winds of hurricane force prevailed from approximately Cape Canaveral to Carysfort Reef Light, a distance of about 240 miles. The great expanse of coast subjected to hurricane force winds, from this storm that moved inland at right angles to the coast line, classes it as one of the great storms on record. It was fortunate that in Florida the most destructive portion of the storm passed inland between the large communities of Miami and Palm Beach. As it was, the less heavily populated area between Fort Lauderdale and Lake Worth bore the brunt of its violence. Pompano, Deerfield, Boca Raton, and Delray Beach were in the path of the strongest winds.

Moving on a westward course across the State at about 10 m. p. h., the storm emerged into the Gulf of Mexico, with the center passing a short distance north of Naples at about 10 p. m. on the 17th. It had passed over swamplands of the Everglades and the Big Cypress, with little damage resulting. The section around Lake Okeechobee was swept by the highest winds, but the dikes held and there was no flooding directly from the Lake. Heavy rains of around 6 to 8 inches, coming on top of a completely saturated soil with some areas already partly flooded, resulted in extensive flooding of rich farm lands and pastures. The loss to crops, especially sugarcane, was estimated at several million dollars, and a considerable number of livestock were lost.

Reaching Florida's west coast communities, the storm retained much of its intensity. The strongest wind reported was observed at Sanibel Light, where gusts of 120 m. p. h. were recorded. At Fort Myers the highest wind

was estimated at 90 m. p. h., with gusts to 110 m. p. h. Heavy damage occurred along the west coast from Everglades City to Sarasota, with greatest damage in the Fort Myers-Punta Gorda area. Everglades City was inundated to a depth of 2 feet by tidewater which rose 5½ feet above normal. At Naples the lull was felt for an hour between 9 and 10 p. m. on the 17th, with the wind dropping to 12 m. p. h. at 9:45 p. m. North of Naples strong offshore winds resulted in below-normal tides.

For Florida, property damage and crop losses were estimated at slightly over \$31,000,000. Eleven persons were killed as a direct result of the storm, and six others died through related accidents and electrocutions. Among the dead were seven of the crew members of a Cuban fishing vessel, *Antonio Cerdado*, which foundered a short distance off Fort Myers.

OVER THE GULF

After leaving Florida the hurricane turned to a more northwesterly course over the Gulf of Mexico, and, increasing to about 18 m. p. h. in its progressive movement, swept on to the Mississippi and Louisiana coasts during the morning of September 19. By 5 a. m. winds of hurricane force (75 m. p. h. or over) were being felt over the Chandeleur Islands as far northward as Chandeleur Light. The highest tide, 14 feet above normal high tide, was recorded at Chandeleur Light.

Along the Mississippi coast, from Pearlinton to Pascagoula, winds reached hurricane force at about 6:30 a. m. of the 19th. Similar winds reached the eastern edge of metropolitan New Orleans at 7:30 a. m. and an hour later extended to the Moisant Airport, just west of the city. These coastal communities experienced the strongest winds of the storm and the greatest duration of hurricane force winds. From Pearlinton, which endured 5½ hours of these winds, an observer reported that at 3 p. m. he noticed that a south wind was carrying water back into the Pearl River. At 4 p. m. the bayous near Pearlinton and the Pearl River at Logtown were overflowing and inundating the land up to the floor level of the Logtown Post Office, with the river flowing upstream at a rate of about 15 m. p. h. Tides along the Mississippi coast rose to 12 feet at Biloxi, Bay St. Louis, and Gulfport, and to about 9 feet at Pascagoula and in the Lake Catherine-Chef Menteur area.

OVER MISSISSIPPI AND LOUISIANA

The calm center, which passed directly over the business district of New Orleans and the city of Baton Rouge, was estimated to be about 25 miles in diameter as it passed over New Orleans. Moisant Airport was flooded to a depth of 2 feet, and during the height of the storm part of the roof of the Administration Building gave way, forcing employees to run to another building in the area. Baton Rouge was not seriously menaced by high winds until about noon, by which time the hurricane was dissipating rapidly. Hurricane force winds did not reach any section west of Melville, La., where the highest wind was estimated as 75 m. p. h., occurring between 3:30 and 4 p. m.

In Mississippi and Louisiana it was estimated that 90 percent of the damage was caused by water. In Mississippi most of the severe water damage was limited to a section within two blocks of the water front. Homes there are built practically to the edge of the water, and there is no sea wall for protection. Minor flooding occurred in one section of New Orleans due to a break in the Industrial Canal levee, and more severe flooding occurred in Jefferson Parish because of breaks in the em-

TABLE 1.—Meteorological data for hurricane of Sept. 10–19, 1947

[All times eastern standard]

Station	Date of observation	Lowest pressure reported (inches) ¹	Time of lowest pressure	Maximum wind velocity for a 6-minute period	Time of maximum velocity	Maximum wind velocity for a 1-minute period	Time of extreme velocity	Velocity of extreme gust	Miscellaneous
Apalachicola, Fla.	19	29.60		SE 54	12:09 a.	SE 67	12:11 a.		6-ft. tide, 5 a. m.
Baton Rouge, La.	19	28.60	2:40 p.			96	3:10 p.	120	In eye of the storm, 3 p. m.
Bay St. Louis, Miss.	19	29.10	11:30 a.	NE 12	10:00 a.				12-ft. tide, 11 a. m.
Biloxi, Miss.	19			E 96	10:00 a.				12-ft. tide, 11 a. m.
Burrwood, La.	19	29.98	7:40 a.	NW 66	5:28 a.	72	6:00 a.	60	3.94-ft. tide.
Carysfort Reef Light, Fla.	17	29.29	1:45 p.	SW 68	2:25 p.	76	2:25 p.		
Daytona Beach, Fla.	17	29.82				43	6:18 p.		
Everglades City, Fla.	17	28.81	7:45 p.	35	3:30 p.			60-65	Flooded, 2 ft.
Fort Lauderdale, Fla.	17	28.22	12 noon					127	1-hr. lull.
Fort Myers, Fla.	17	28.82	10:15 p.	85-90	10:15 p.	NNW 90		NNW 110	No lull.
Hillsboro Light, Fla.	17	27.97	11:25 a.	NW 121	9:57 a.	ENE 155	12:56 p.		
Hope Town, Bahamas	16	28.18	2:30 p.			NW 160			
Key West, Fla.	18	29.52							
Lakeland, Fla.	17	29.63		NE 34	7:57 p.	ENE 46	8:01 p.	ENE 75	
Melbourne, Fla.	17	29.71	2:25 p.			ESE 54	7:30 p.	85	
Miami, Fla.	17	28.72	12 noon	W 85	11:00 a.	SSW 90	2:00 p.		
Mobile, Ala.	19	29.54	5:20 a.	E 43		E 49		55-60	3.09-in. rain.
Moorehaven, Fla.	17	29.09	5:00 p.	NE 82	5:00 p.	NE 92	5:00 p.		5.82-in. rain.
Naples, Fla.	17	28.80	11:45 p.	NW 100	8:00 p.	NW 105	8:05 p.		Lull 9-10 p. m.
New Orleans, La.	19	28.61	10:47 a.			110	10:00 a.	N 125	
Pensacola, Fla.	19	29.54	4:20 a.	SE 61	6:00 a.	SE 91	6:00 a.		4.8-ft. tide, 9 a. m.
Ponce de Leon Light, Fla.	18	29.85		E 66	12:05 a.	E 75	12:05 a.		
Sanibel Light, Fla.	18	28.67						S 120	Flooded, 3 ft.
Tampa, Fla.	18	29.53	3:30 a.	NE 34	3:12 a.	NE 38	3:12 a.		4.08-in. rain.
West Palm Beach, Fla.	17	29.02	10:30 a.			NNE 100		110	
Reported extremes		27.97		NW 121		NW 160			

¹ Reduced to sea level.² Estimated.

NOTE.—Under column "velocity of extreme gust," where no direction is given, this direction was not reported.

bankment or overflowing in sections not protected by embankments.

The American Red Cross released a list of 34 fatalities for these two States: 22 deaths in Mississippi, 12 in Louisiana. On the Gulf coast, 1,642 homes were destroyed and upward of 25,000 others damaged.

A tabular listing of the lowest barometric pressures and highest wind velocities observed at selected stations in Florida, Mississippi, and Louisiana during this hurricane is contained in Table 1.

VII. *Tropical disturbance of September 20–25.*—This disturbance developed in the eastern Caribbean south of Cuba on September 20 from an easterly wave. Moving northwestward, it crossed western Cuba during the night of the 21st without becoming a well-defined circulation, although it was preceded by an area of squalls with winds up to 40–50 m. p. h. for a distance of 200 miles or more to the northward. After it entered the Gulf of Mexico west of Havana, it slowly increased in intensity and thereafter had a fairly well-defined center as it moved up the Florida west coast and passed inland between Tampa and Cedar Keys, between 5 and 6 p. m. on the 23d. Winds of about 60 m. p. h. were reported along the west Florida coast from Sarasota northward to near Cedar Keys, and squalls of 40–60 m. p. h. were quite general over the entire peninsula.

The lowest pressures reported were 989.8 mb. (29.23 inches) at Cedar Keys and 989.5 mb. (29.22 inches) at Saint Leo, as the center passed inland between these two communities. Rainfall was heavy throughout the State and greatly aggravated the flood situation already existing from the earlier hurricane and previous rains. The storm lost force rapidly as it moved northeastward. It passed west of Jacksonville during the night of the 23d and on the following morning was located west of Savannah and Charleston. Its remnants moved off into the Atlantic between the North Carolina and the Virginia Capes on the morning of the 25th.

A series of small tornadoes occurred on the northern edge of this storm as it advanced northward over Florida. Two or three occurred in the west coast area around Tampa, one near Ocala, and four in and around Jacksonville. These tornadoes were small, short-lived, and did

not cause extensive damage. There was some damage along the beaches from Bradenton to Tarpon Springs and slight damage to power and communication lines. Total damage was estimated at \$100,000.

VIII. *Tropical disturbance of October 6–7.*—A moderate and partly developed easterly wave disturbance had its inception over the Bahama Islands and Florida Straits on October 6. It advanced northward and then northwestward and moved inland near Brunswick, Ga., during the night of October 6–7. Highest winds reported were Beaufort force 9 (47–54 m. p. h.) from ships off the Georgia coast during the afternoon of the 6th. The strongest wind along the coast was about 50 m. p. h. No damage was reported.

IX. *Severe hurricane of October 9–15.*—This storm was first noted as it developed on the intertropical convergence zone which had moved north of the Isthmus of Panama. On the 9th the storm was centered off the coast of Cape Gracias, Nicaragua. During the night of the 10th it crossed Cuba a short distance west of Havana as a moderate storm, with the strongest winds reported as gusts of 57 m. p. h., at Batista Field. After entering the Gulf of Mexico, and within a short period of 3 to 4 hours, the storm's winds rapidly increased to hurricane force. At Dry Tortugas the anemometer became inoperative at 12:30 p. m. on the 10th, while the instrument was registering 84 m. p. h., and the observer reported that higher winds were experienced during the hour following this reading. On the night of October 11–12 the hurricane passed over the extreme southern portion of the Florida Peninsula. Although at this stage the storm was accompanied by a small center of hurricane winds, there was little wind damage as it passed over swamplands from the time it entered the west coast north of Cape Sable until it reached the east coast communities between Miami and Palm Beach.

The Weather Bureau Office in downtown Miami recorded 62 m. p. h. for the fastest wind speed at 12:23 a. m., and a low pressure of 998.0 mb. (29.47 inches) as the center passed a short distance to the northwest. At the Airport Station, about 7 miles closer to the storm center, the lowest pressure recorded was 995.3 mb. (29.39 inches). In moving off the east coast into the Atlantic

the center passed directly over Hillsboro Lighthouse, near Pompano, where the calm center was experienced between 3:30 a. m. and 4:30 a. m. on the 12th. The strongest winds recorded were 86 m. p. h., averaged for 5 minutes, and 92 m. p. h. for the fastest mile of wind, both registered at 2:30 a. m. The lowest pressure, 991.2 mb. (29.27 inches), occurred at 2:45 a. m. Since this was the same area that had been raked by the great hurricane of the previous month, there was little left that could be damaged by the weaker winds of the second storm. However, the heavy rainfall associated with it, added to the dangerous flood conditions already existing over south Florida, resulted in the worst flood ever experienced in the section. Rainfall of from 5 to 13 inches with this hurricane was confined to south Florida from around the Lake Okeechobee area southward. At the Hialeah Water Plant rain was so intense that a recording gage registered 6 inches in 1 hour and 15 minutes, before the gage overflowed. At the Miami City Office, which was on the edge of the heavy rain area, 3.60 inches of rain fell in 1 hour, and 1.32 inches in 10 minutes. Such rains did not in themselves cause the flood but climaxed a very wet season for which total flood damage in the State was estimated at approximately \$20,000,000. The flooded area covered a good portion of 12 counties and lesser portions of others, extending from Osceola County southward to the lower end of the peninsula. Wind damage in Florida amounted to about \$75,000.

After leaving Florida the hurricane was followed by

aircraft as it moved on a northeastward course over the Atlantic, although insufficient observations during the night of October 13-14 made its movement uncertain during that time. A reconnaissance plane entered the storm area during the early hours of the 14th, and highest winds were estimated at 50 to 55 knots. During the afternoon the storm gained force, and when another plane flew into the center at about sunset, winds were estimated at 80 knots. Moving on a westward course, the center moved over Georgia at about 7 a. m. of the 15th, a short distance south of Savannah. The lowest pressure at Savannah was 973.9 mb. (28.76 inches) at 7 a. m., and the strongest wind was estimated at 85 m. p. h. at 6:59 a. m., with gusts estimated as high as 95 m. p. h. The area of hurricane winds was small, probably about 40 miles in width.

The city of Savannah and its vicinity experienced the worst part of the hurricane when the center passed inland about 15 miles to the south. Damage in the Savannah area was estimated at approximately \$2,000,000, while in all other areas of Georgia damage did not exceed \$500,000. Some structural damage occurred in Savannah, with many roofs damaged either by direct action of the wind or by falling trees. Window glass was extensively broken while signs, ventilators, chimney tops, awnings, and like objects were blown down. A small tornado was reported near Hinesville, Ga., in the storm area.

High tides along the Georgia and South Carolina coasts ranged from 12.0 feet above mean low tide at Savannah Beach, Ga., and Parris Island, S. C., to 9.0 feet at Charles-

TABLE 2.—North Atlantic hurricanes and tropical disturbances of 1947

[Number of storm in table corresponds to number of track on following Chart]

Storm	Date	Area where first reported	Coast lines crossed	Highest wind speed reported	Lowest pressure reported ¹	Place of dissipation	Intensity	Remarks
I	July 31-Aug. 1	Southwestern Gulf of Mexico.	Texas and Mexico.	44 m.p.h. at Port Isabel, Tex.	1,001.7 mb. (29.58 inches) at Brownsville, Tex.	Extreme southern portion of Texas.	Minor disturbance.	Damage to cotton crop caused by heavy rains estimated at \$2,000,000.
II	Aug. 12-15	Northwestern Caribbean Sea, about 150 miles northwest of Swan Island.	Yucatan and Mexico.	110 m.p.h. at Tampico, Mexico.	No data.	Interior of Vera Cruz.	Hurricane.	19 persons lost their lives in the vicinity of Tampico, Mexico.
III	Aug. 18-27	Florida Straits.	Texas.	72 m.p.h. at Galveston, Tex.	992.2 mb. (29.30 inches) at Galveston, Tex.	Interior of Texas.	Near hurricane intensity along latter portion of track.	Total damage estimated at about \$757,500. 1 person killed in Galveston as a result of contact with live wire.
IV	Aug. 21-22	North-central Gulf of Mexico.	Louisiana.	44 m.p.h. at Grand Isle, La.	No data.	Southern Louisiana.	Minor disturbance.	No loss of life or property damage reported.
V	Sept. 7-8	Northeast Gulf of Mexico.	Alabama and Mississippi.	Gusts to 51 m.p.h. reported at Pensacola, Fla.	1,005.8 mb. (29.70 inches) at Mobile, Ala.	Interior of Mississippi.	do.	Two ships went aground in Mobile Bay but were later refloated.
VI	Sept. 10-19	Near latitude 15° N., longitude 49° W.	Florida, Louisiana, and Mississippi.	160 m.p.h. from the northwest at Hope-town, Bahama Islands.	947.2 mb. (27.97 inches) at Hillsboro Light, Fla.	Mississippi valley.	Major hurricane.	Most severe hurricane of the season. A total of 51 lives lost: 17 in Florida, 12 in Louisiana, and 22 in Mississippi. Total damage estimated at about \$110,000,000.
VII	Sept. 20-25	Caribbean Sea south of Cuba.	Cuba and Florida.	Winds of about 60 m.p.h. were reported along the Florida west coast from Sarasota northward to near Cedar Keys.	989.5 mb. (29.22 inches) at Saint Leo, Fla.	Atlantic Ocean off the Virginia Capes.	Not of hurricane intensity.	Heavy rain accompanying this storm aggravated a flood situation which existed in Florida as a result of the recent hurricane.
VIII	Oct. 6-7	Bahama Islands and Florida Straits.	Georgia.	Beaufort force 9 (47-54 m.p.h.) from ships off the Georgia Coast.	No data.	Georgia coastal area.	do.	Strongest wind on the coast about 50 m.p.h. No damage reported.
IX	Oct. 9-15	Southwestern Caribbean Sea.	Cuba, Florida, and Georgia.	Gusts of 95 m.p.h. estimated at Savannah, Ga.	973.9 mb. (28.76 inches) at Savannah, Ga.	Eastern Georgia.	Severe hurricane.	Damage in Georgia and the Carolinas estimated at about \$3,000,000. Heavy to excessive rains, associated with this hurricane in Florida, climaxed a very wet season for which total damage from flooding in the State has been estimated at approximately \$20,000,000. 1 man killed in Charleston by a falling tree.
X	Oct. 16-20	North of the Virgin Islands.	None.	In excess of 100 m.p.h. at Bermuda.	No data.	North Atlantic Ocean.	Hurricane.	No loss of life or damage reported.

¹ Pressure reduced to sea level.

ton, S. C., and 9.6 feet at St. Simons Island, near Brunswick, Ga. The lower portions of Charleston were flooded to a depth of about 1 foot, while low-lying beaches and islands in the area also suffered considerable damage. Salt-water flooding damaged the rice crop. Some small communities as far north as Cape Hatteras were partly or wholly inundated by tides. The only death reported in connection with this hurricane during its entire history was at Charleston, S. C., where a man was killed by a falling tree.

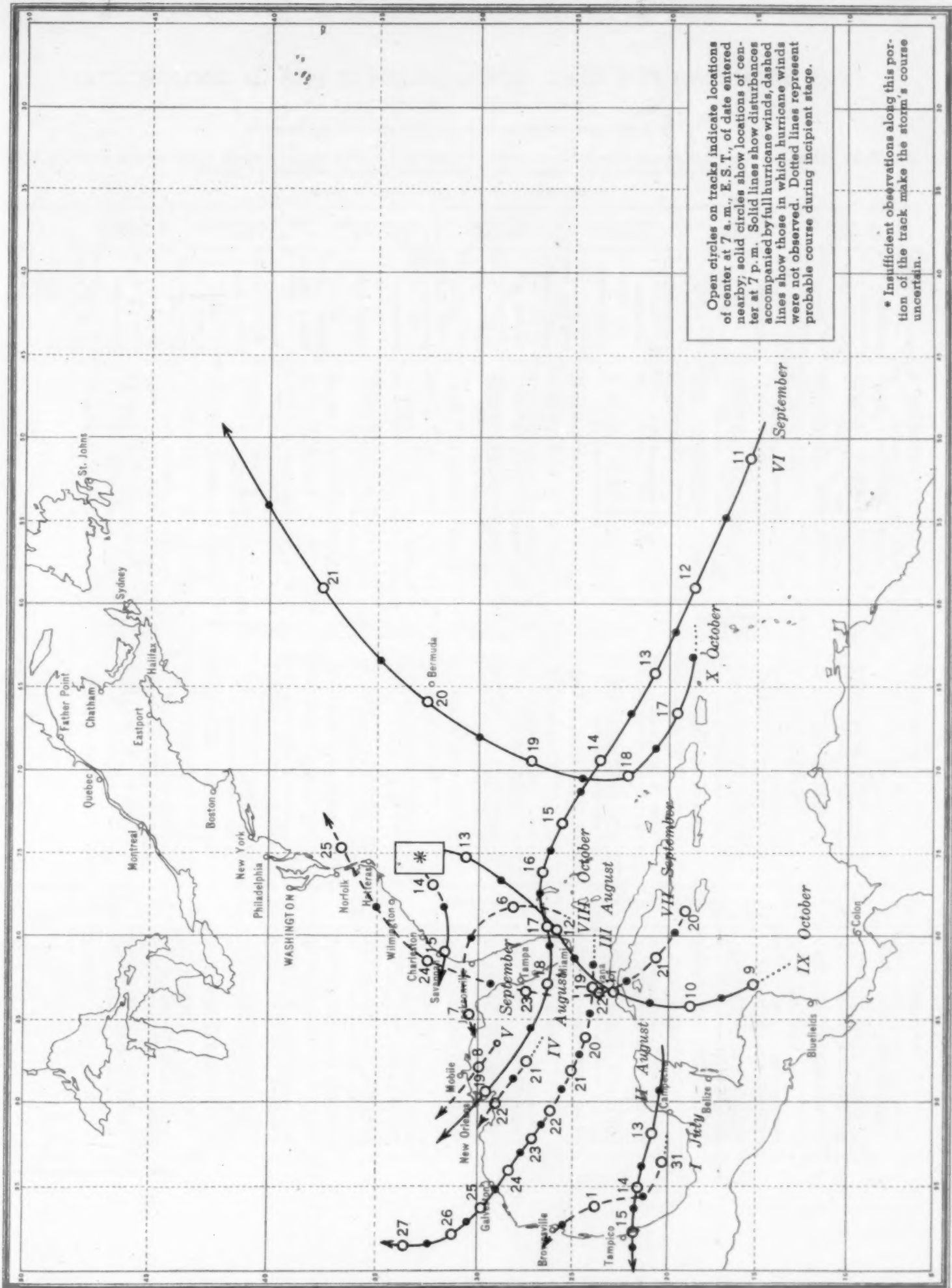
X. *Hurricane of October 16-20.*—The last storm of the season was first noted east of the Leeward Islands as an

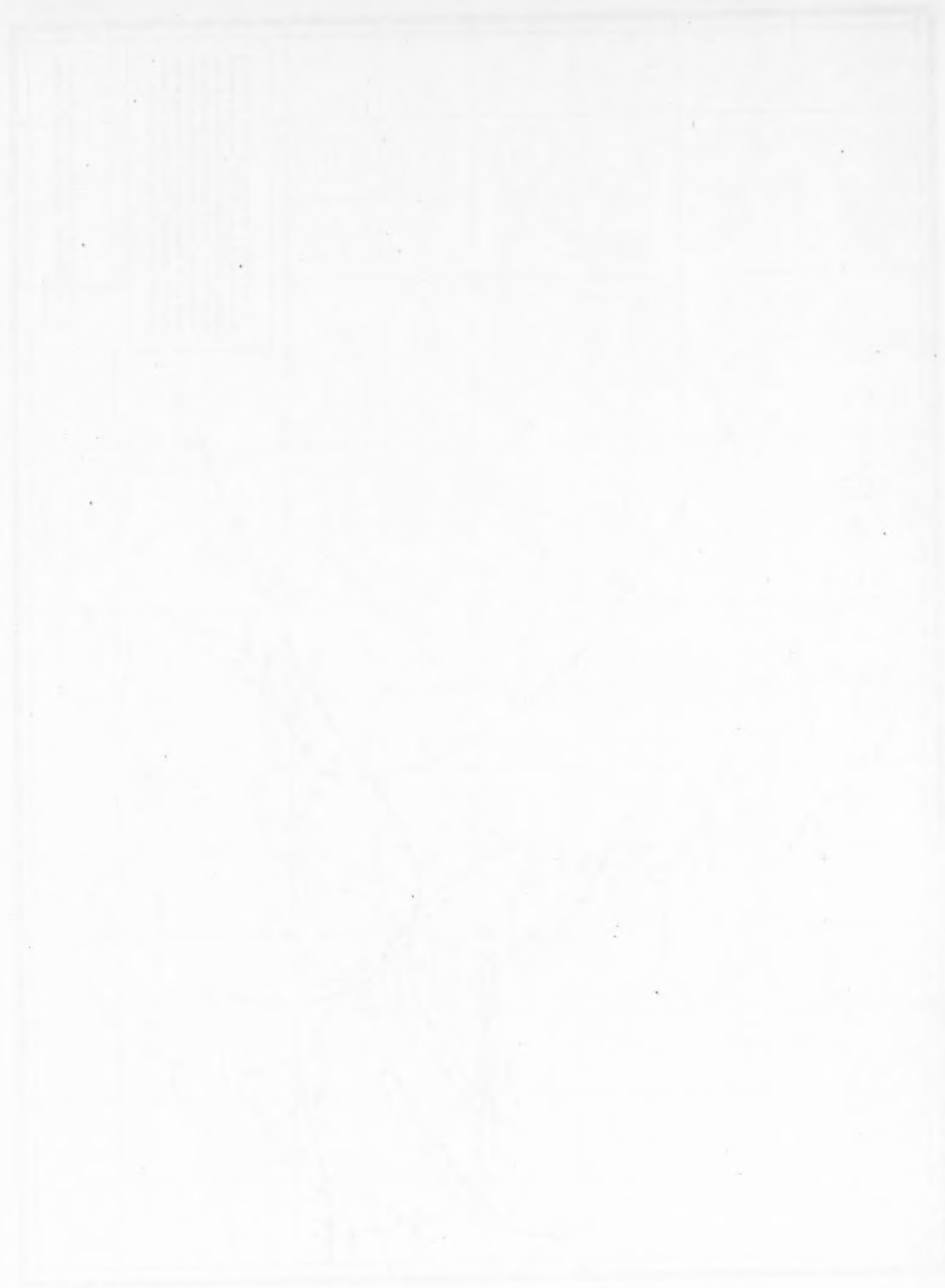
easterly wave. This wave developed into a closed circulation on the 16th north of the Virgin Islands and moved on a broad curving path over the Atlantic. It reached hurricane intensity during the night of the 17th when it was some distance northeast of Turks Island. Its curving path brought the center to a point slightly west of Bermuda, where during the forenoon of the 20th winds in excess of 100 m. p. h. were reported. A report from the Danish S. S. *Astra* indicated that winds of Beaufort force 11 (64-75 m. p. h.) and a low barometric pressure of 958.4 mb. (28.30 inches) were experienced near the center of this storm as far north as latitude 42.5° N.

The first of the season was a tropical storm which developed on August 15, 1947, off the coast of Central America. It moved northward and made landfall on the Yucatan Peninsula on August 18, 1947, as a tropical storm. It then moved inland and dissipated on August 20, 1947.

The second of the season was a tropical storm which developed on August 25, 1947, off the coast of Central America. It moved northward and made landfall on the Yucatan Peninsula on August 28, 1947, as a tropical storm. It then moved inland and dissipated on August 30, 1947.

Tracks of North Atlantic Hurricanes and Tropical Disturbances of 1947





METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR DECEMBER 1947

AEROLOGICAL OBSERVATIONS

[For description of change in Table 1 and charts, see REVIEW, January 1946, p. 6]

TABLE 1.—Mean dynamic height (geopotential) in units of 0.98 dynamic meters, temperature in degrees centigrade, and relative humidity in percent, for standard pressures, as obtained by radiosondes during December 1947

STATIONS AND MEAN SURFACE PRESSURES

Standard pressure surface (mb.)	Albany, N. Y. (1,006.5 mb.)			Albuquerque, N. Mex. (838.2 mb.)			Apalachicola, Fla. (1,019.5 mb.)			Atlanta, Ga. (985.3 mb.)			Auburn, Calif. (960.6 mb.)			Big Spring, Tex. (928.7 mb.)			Bismarck, N. Dak. (957.0 mb.)									
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity				
Surface.....	31	86	-5.4	75	31	1,620	-2.2	51	30	5	12.8	87	31	300	5.8	77	31	501	6.8	74	31	774	7.0	64	31	505	-9.0	80
1,000.....	31	136	(*)	---	31	169	(*)	---	30	168	13.8	81	31	177	(*)	---	31	167	(*)	---	31	157	(*)	---	31	162	(*)	---
950.....	31	544	-6.5	75	31	601	(*)	---	30	604	12.6	75	31	605	8.3	63	31	596	8.8	64	31	588	(*)	---	31	553	-8.7	88
900.....	31	900	-7.4	76	31	1,045	(*)	---	30	1,053	11.3	69	31	1,046	7.4	56	31	1,040	7.7	51	31	1,033	8.7	54	31	984	-5.8	76
850.....	31	1,404	-8.5	75	31	1,506	(*)	---	30	1,530	9.7	61	31	1,516	6.5	52	31	1,508	5.3	46	31	1,505	7.1	48	31	1,433	-5.1	67
800.....	31	1,873	-9.8	71	31	1,996	1.3	49	30	2,032	8.4	56	31	2,012	4.4	46	31	2,001	2.3	45	31	2,001	4.5	44	31	1,908	-6.4	63
750.....	31	2,377	-11.3	69	31	2,518	-1.5	51	30	2,572	6.3	49	31	2,540	2.2	44	31	2,521	-1.9	46	31	2,527	1.8	40	31	2,418	-8.2	68
700.....	31	2,898	-12.7	64	31	3,059	-4.7	53	30	3,126	3.4	48	31	3,090	-1.1	40	31	3,066	-4.1	45	31	3,077	-1.2	38	31	2,944	-10.8	59
650.....	31	3,469	-15.0	62	31	3,645	-5.1	52	30	3,727	2.2	---	31	3,686	-2.7	39	31	3,650	-7.2	38	31	3,655	-4.4	35	31	3,518	-13.5	56
600.....	31	4,004	-17.8	62	31	4,257	-11.5	47	30	4,361	-3.4	---	31	4,311	-6.0	34	31	4,267	-11.0	39	31	4,290	-8.2	---	31	4,116	-16.9	53
550.....	31	4,714	-21.6	---	31	4,918	-15.6	45	30	5,046	-7.2	---	31	4,991	-9.5	---	31	4,929	-15.4	43	30	4,900	-12.6	---	31	4,767	-20.9	---
500.....	31	5,405	-26.1	---	31	5,630	-20.4	44	30	5,781	-11.8	---	31	5,718	-13.9	---	31	5,643	-20.3	45	31	5,685	-17.5	---	30	5,468	-25.1	---
450.....	31	6,165	-31.0	---	31	6,406	-25.8	---	29	6,583	-17.1	---	31	6,514	-19.4	---	31	6,420	-25.6	---	30	6,471	-22.7	---	30	6,231	-30.3	---
400.....	31	6,986	-36.2	---	31	7,245	-31.8	---	29	7,453	-22.8	---	30	7,375	-26.1	---	31	7,250	-31.0	---	30	7,320	-28.5	---	30	7,053	-36.1	---
350.....	28	7,901	-41.9	---	31	8,175	-38.3	---	29	8,417	-30.1	---	30	8,327	-33.2	---	31	8,188	-38.6	---	29	8,263	-35.3	---	29	7,972	-42.6	---
300.....	26	8,940	-47.5	---	29	9,225	-45.1	---	29	9,496	-38.1	---	30	9,392	-40.8	---	30	9,232	-45.8	---	28	9,324	-42.3	---	28	8,950	-49.3	---
250.....	24	10,137	-52.0	---	28	10,419	-51.4	---	28	10,725	-47.6	---	30	10,609	-49.7	---	30	10,425	-52.8	---	28	10,538	-49.1	---	25	10,154	-54.9	---
200.....	16	11,553	-53.3	---	17	11,868	-53.7	---	28	12,164	-58.0	---	28	12,047	-57.7	---	25	11,848	-57.5	---	23	11,679	-54.6	---	18	11,580	-55.0	---
175.....	10	12,363	-51.5	---	7	12,674	-51.4	---	24	12,987	-62.1	---	20	12,893	-60.0	---	25	12,689	-58.2	---	20	12,813	-55.0	---	12	12,441	-53.3	---
150.....	7	13,353	-53.2	---	---	---	---	---	23	13,941	-64.6	---	9	13,844	-60.5	---	18	13,635	-58.1	---	14	13,800	-57.9	---	10	13,463	-53.9	---
125.....	---	---	---	---	---	---	---	---	18	15,040	-68.4	---	---	---	---	---	9	14,782	-59.5	---	---	---	---	---	---	---	---	

Boise, Idaho (919.8 mb.)				Brownsville, Tex. (1,017.1 mb.)				Buffalo, N. Y. (991.6 mb.)				Caribou, Maine (984.4 mb.)				Charleston, S. C. (1,018.4 mb.)				Cludad Victoria, Mexico (978.0 mb.)				Columbia, Mo. (960.8 mb.)				
Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	
Surface.....	31	868	-0.3	84	31	6	15.4	89	29	221	-3.0	76	31	191	-10.5	86	31	13	8.3	79	31	335	17.5	72	31	239	2.0	69
1,000.....	31	193	(*)	---	31	150	16.1	84	29	152	(*)	---	31	100	(*)	---	31	164	10.3	71	31	143	(*)	---	31	163	(*)	---
950.....	31	609	(*)	---	31	588	14.3	76	29	561	-4.4	76	31	497	-10.4	87	31	600	9.9	64	31	584	16.3	70	31	583	2.2	65
900.....	31	1,043	1.4	76	31	1,041	12.8	67	29	983	-6.2	76	31	910	-11.2	85	31	1,040	0.2	64	31	1,040	13.4	72	31	1,015	2.0	57
850.....	31	1,502	-4.7	69	31	1,521	11.2	63	29	1,429	-7.8	74	31	1,349	-11.6	79	31	1,513	7.5	61	31	1,520	10.7	77	31	1,475	-9.5	54
800.....	31	1,985	-2.7	69	31	2,026	9.5	60	29	1,899	-9.0	70	31	1,811	-13.3	73	31	2,010	5.3	51	31	2,024	9.1	77	31	1,961	-2.4	45
750.....	31	2,497	-5.5	72	31	2,506	7.2	57	29	2,403	-10.5	59	31	2,304	-15.0	67	31	2,541	3.5	45	31	2,565	7.1	72	31	2,481	-1.9	40
700.....	31	3,033	-8.5	73	31	3,125	4.3	53	29	2,927	-12.1	58	31	2,821	-16.8	62	31	3,094	1.0	---	31	3,123	4.4	69	31	3,023	-4.4	40
650.....	31	3,608	-11.5	73	31	3,727	1.4	49	29	3,468	-14.6	54	31	3,380	-19.7	60	31	3,690	-1.7	---	31	3,728	1.4	58	31	3,608	-7.2	37
600.....	31	4,214	-15.1	67	31	4,306	-2.3	43	29	4,094	-17.2	55	29	3,972	-23.2	---	31	4,320	-5.5	---	31	4,365	-2.2	49	31	4,224	-10.8	---
550.....	31	4,869	-19.5	66	30	5,054	-6.6	42	29	4,746	-20.9	---	29	4,606	-26.8	---	29	4,999	-9.7	---	31	5,054	-6.3	46	30	4,891	-15.1	---
500.....	31	5,568	-24.2	---	30	5,792	-11.5	47	29	5,441	-25.2	---	29	5,287	-30.5	---	28	5,728	-14.5	---	31	5,791	-11.1	47	30	5,603	-20.0	---
450.....	31	6,335	-29.7	---	29	6,602	-16.8	53	27	6,197	-30.4	---	29	6,033	-35.3	---	28	6,525	-19.7	---	31	6,602	-16.3	49	29	6,379	-25.6	---
400.....	31	7,158	-35.6	---	28	7,468	-22.7	---	26	7,020	-36.2	---	29	6,840	-40.9	---	27	7,387	-25.4	---	31	7,470	-22.0	---	29	7,216	-31.7	---
350.....	30	8,076	-42.0	---	28	8,434	-29.5	---	24	7,947	-42.2	---	28	7,742	-46.6	---	27	8,342	-31.9	---	31	8,437	-29.5	---	29	8,147	-38.4	---
300.....	27	9,119	-48.7	---	28	9,516	-37.6	---	23	8,971	-48.7	---	25	8,764	-50.3	---	24	9,415	-39.6	---	31	9,519	-37.7	---	25	9,209	-45.4	---
250.....	17	10,347	-54.6	---	25	10,747	-46.7	---	17	10,157	-52.1	---	18	9,958	-52.2	---	23	10,642	-48.9	---	19	10,763	-47.2	---	17	10,403	-52.7	---
200.....	11	11,758	-57.4	---	20	12,195	-57.0	---	10	11,580	-53.7	---	15	11,377	-52.0	---	22	12,071	-58.2	---	10	12,204	-58.0	---	14	11,810	-57.5	---
175.....	8	12,589	-56.2	---	13	13,042	-59.4	---	5	12,387	-53.2	---	10	12,258	-52.0	---	19	12,903	-61.7	---	7	13,045	-61.8	---	9	12,648	-55.9	---
150.....	---	---	---	---	6	14,021	-61.5	---	---	---	---	---	---	---	---	9	13,785	-62.8	---	---	---	---	---	---	---	---		

Dodge City, Kans. (925.8 mb.)				El Paso, Tex. (882.8 mb.)				Ely, Nev. (808.9 mb.)				Fort Worth, Tex. (904.7 mb.)				Glasgow, Mont. (939.1 mb.)				Grand Junction, Colo. (884.6 mb.)				Great Falls, Mont. (885.5 mb.)				
Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	
Surface.....	31	787	-0.4	83	31	1,195	6.4	46	30	1,908	-3.8	76	31	211	8.8	73	31	648	-4.7	80	31	1,474	-2.6	81	31	1,128	0.0	64
1,000.....	31	163	(*)	---	31	153	(*)	---	30	190	(*)	---	31	166	(*)	---	31	148	(*)	---	31	202	(*)	---	31	140	(*)	---
950.....	31	582	(*)	---	31	587	(*)	---	30	615	(*)	---	31	600	9.4	63	31	559	(*)	---	31	625	(*)	---	31			

TABLE 1.—Mean dynamic height (geopotential) in units of 0.98 dynamic meters, temperature in degrees centigrade, and relative humidity in percent, for standard pressures, as obtained by radiosondes during December 1947—Continued

Standard pressure surface (mb.)	Greensboro, N. C. (988.1 mb.)				Hatteras, N. C. (1,019.0 mb.)				Havana, Cuba ¹ (.... mb.)				Honolulu, T. H. (1,014.0 mb.)				Huntington, W. Va. (1,000.1 mb.)				International Falls, Minn. (975.2 mb.)				Joliet, Ill. (997.0 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface.....	31	273	1.7	73	31	3	8.9	80	---	---	---	---	30	3	24.5	64	31	172	0.1	80	31	360	-12.6	90	31	178	-1.6	79
1,000.....	31	176	(*)	---	31	159	9.6	70	---	---	---	---	30	125	22.8	66	31	172	(*)	---	31	166	(*)	---	31	153	(*)	---
950.....	31	595	4.2	55	31	588	8.1	63	---	---	---	---	30	576	18.9	72	31	590	1.7	70	31	561	-11.3	87	31	566	-2.3	77
900.....	31	1,032	3.3	49	31	1,029	6.6	51	---	---	---	---	30	1,032	15.6	76	31	1,020	0.0	63	31	975	-10.9	85	31	991	-2.1	66
850.....	31	1,494	2.5	41	31	1,497	5.1	46	---	---	---	---	30	1,515	13.0	68	31	1,477	-1.2	52	31	1,415	-9.8	75	31	1,445	-2.2	52
800.....	31	1,983	1.3	35	31	1,990	3.1	43	---	---	---	---	30	2,024	11.3	52	31	1,959	-2.6	48	31	1,883	-10.4	65	31	1,926	-3.4	51
750.....	31	2,505	-9.9	---	31	2,515	9.9	42	---	---	---	---	30	2,568	9.2	44	31	2,475	-3.9	41	31	2,383	-11.7	61	31	2,441	-5.1	52
700.....	31	3,048	-3.4	---	31	3,062	-1.7	42	---	---	---	---	30	3,130	6.4	36	31	3,011	-6.1	43	31	2,904	-13.7	59	31	2,975	-7.5	50
650.....	31	3,634	-6.0	---	31	3,655	-4.7	43	---	---	---	---	30	3,738	3.1	34	31	3,593	-8.9	45	31	3,470	-16.4	55	30	3,550	-10.7	50
600.....	31	4,254	-9.1	---	31	4,276	-7.8	39	---	---	---	---	30	4,378	-4.2	---	31	4,205	-11.9	45	31	4,063	-19.6	53	30	4,156	-14.0	47
550.....	31	4,924	-13.1	---	31	4,954	-11.6	38	---	---	---	---	30	5,069	-4.2	---	31	4,868	-15.5	44	31	4,708	-23.2	---	29	4,812	-17.8	---
500.....	31	5,642	-17.8	---	31	5,672	-16.0	43	---	---	---	---	30	5,814	-8.8	---	30	5,582	-19.8	45	31	5,397	-27.4	---	29	5,518	-22.5	---
450.....	31	6,432	-22.8	---	30	6,467	-21.0	---	---	---	---	---	30	6,629	-14.5	---	30	6,360	-25.1	---	31	6,153	-32.3	---	29	6,287	-27.9	---
400.....	31	7,277	-28.7	---	30	7,319	-26.8	---	---	---	---	---	29	7,502	-21.7	---	29	7,198	-30.8	---	31	6,970	-37.9	---	29	7,120	-33.7	---
350.....	31	8,219	-35.7	---	30	8,270	-33.2	---	---	---	---	---	28	8,470	-28.8	---	28	8,148	-36.9	---	31	7,877	-44.2	---	29	8,044	-39.8	---
300.....	26	9,296	-42.6	---	29	9,333	-40.7	---	---	---	---	---	29	9,556	-36.6	---	28	9,197	-44.0	---	31	8,896	-50.1	---	28	9,078	-46.3	---
250.....	25	10,503	-51.5	---	27	10,556	-49.6	---	---	---	---	---	28	10,800	-45.0	---	28	10,399	-51.8	---	28	10,083	-53.6	---	23	10,258	-52.5	---
200.....	18	11,950	-58.9	---	22	11,980	-57.0	---	---	---	---	---	28	12,261	-53.6	---	23	11,816	-56.8	---	23	11,511	-52.4	---	15	11,677	-54.8	---
175.....	18	12,781	-61.1	---	15	12,813	-58.8	---	---	---	---	---	28	13,111	-58.0	---	17	12,669	-59.4	---	18	12,385	-51.5	---	9	12,510	-54.8	---
150.....	14	13,740	-62.0	---	9	13,761	-58.9	---	---	---	---	---	26	14,071	-62.3	---	9	13,662	-60.9	---	14	13,367	-51.7	---				
125.....	9	14,855	-64.5	---					---	---	---	---	22	15,176	-68.0	---					7	14,578	-52.4	---				
100.....													14	16,492	-73.1	---												
80.....													12	17,794	-73.2	---												
60.....													6	19,479	-66.7	---												
50.....													5	20,609	-60.9	---												

Standard pressure surface (mb.)	Lake Charles, La. (1,019.5 mb.)				Lander, Wyo. (828.0 mb.)				Las Vegas, Nev. (951.7 mb.)				Little Rock, Ark. (1,011.1 mb.)				Mazatlan, Mexico (1,010.4 mb.)				Medford, Oreg. (972.9 mb.)				Merida, Mexico (1,012.1 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface.....	31	5	10.6	85	31	1,696	-4.6	69	31	574	6.8	58	31	70	5.9	78	30	14	21.0	73	31	401	3.6	90	31	27	23.6	82
1,000.....	31	166	12.3	73	31	177	(*)	---	31	162	(*)	---	31	169	6.8	72	30	104	20.9	67	31	177	(*)	---	31	132	23.4	80
950.....	31	602	10.6	72	31	596	(*)	---	31	593	(*)	---	31	593	6.6	63	30	550	20.4	50	31	600	4.1	88	31	581	20.6	79
900.....	31	1,075	9.9	63	31	1,034	(*)	---	31	1,035	7.5	45	31	1,034	5.4	52	30	1,013	17.6	47	31	1,034	3.5	75	31	1,046	17.6	79
850.....	31	1,520	8.4	60	31	1,487	(*)	---	31	1,503	4.7	46	31	1,500	4.3	43	30	1,499	14.5	44	31	1,497	1.7	70	31	1,533	15.0	72
800.....	31	2,020	6.7	54	31	1,969	-1.4	56	31	1,995	1.8	47	31	1,992	2.9	38	30	2,008	11.3	41	31	1,983	-8.8	65	31	2,045	12.5	66
750.....	31	2,556	4.8	48	31	2,488	-3.4	50	31	2,520	-1.1	46	31	2,521	9.7	37	30	2,547	8.2	35	31	2,501	-3.3	58	31	2,580	10.2	54
700.....	31	3,110	2.3	44	31	3,025	-6.4	53	31	3,060	-4.2	43	31	3,064	-1.6	38	30	3,110	4.7	34	31	3,040	-5.9	53	31	3,156	7.6	48
650.....	30	3,708	-7.7	37	31	3,605	-10.4	56	31	3,644	-7.7	43	31	3,654	-4.4	---	30	3,709	9.9	---	30	3,623	-9.0	57	31	3,762	4.2	50
600.....	30	4,339	-4.3	---	31	4,212	-14.3	58	31	4,259	-11.3	---	31	4,278	-7.7	---	29	4,348	-3.2	---	30	4,235	-12.8	57	29	4,412	-5.5	53
550.....	30	5,023	-8.1	---	31	4,870	-18.9	58	31	4,921	-16.0	---	30	4,951	-11.8	---	29	5,033	-7.5	---	29	4,897	-16.5	57	29	5,102	-4.0	51
500.....	30	5,755	-12.8	---	31	5,569	-23.7	---	31	5,632	-21.1	---	30	5,673	-16.4	---	29	5,767	-12.6	---	29	5,608	-21.3	---	29	5,850	-8.7	46
450.....	30	6,561	-18.1	---	31	6,338	-29.3	---	31	6,406	-26.5	---	30	6,466	-21.9	---	29	6,570	-18.1	---	29	6,377	-26.8	---	29	6,666	-13.6	43
400.....	30	7,423	-24.4	---	31	7,160	-35.9	---	30	7,233	-32.7	---	30	7,315	-27.6	---	29	7,434	-24.0	---	29	7,215	-32.5	---	29	7,546	-19.8	43
350.....	30	8,383	-31.5	---	31	8,074	-42.9	---	29	8,166	-39.0	---	28	8,256	-34.3	---	28	8,394	-31.6	---	29	8,143	-39.1	---	28	8,322	-27.5	---
300.....	30	9,456	-39.4	---	31	9,097	-49.8	---	29	9,206	-45.9	---	27	9,322	-41.8	---	28	9,468	-39.3	---	29	9,183	-46.5	---	29	9,611	-36.4	---
250.....	28	10,676	-48.5	---	29	10,271	-54.4	---	29	10,401	-52.6	---	21	10,537	-49.6	---	26	10,691	-48.4	---	28	10,370	-54.1	---	28	10,848	-46.6	---
200.....	25	12,121	-57.7	---	25	11,678	-55.2	---	25	11,821	-56.3	---	12	11,970	-57.4	---	23	12,129	-57.6	---	23	11,776	-57.8	---	11	12,301	-58.2	---
175.....	17	12,966	-61.1	---	19	12,503	-64.2	---	21	12,659	-56.0	---	5	12,773	-60.6	---	18	12,954	-60.6	---	17	12,631	-58.4	---				
150.....	10	13,925	-63.7	---	11	13,524	-64.9	---	16	13,620	-56.7	---					7	13,915	-63.1	---								
125.....	5	15,063	-66.3	---	5	14,651	-66.5	---	12	14,786	-59.2	---																

Standard pressure surface (mb.)	Miami, Fla. (1,017.8 mb.)				Nantucket, Mass. (1,013.5 mb.)				Nashville, Tenn. (999.4 mb.)				New Orleans, La. (1,019.8 mb.)				North Platte, Nebr.			
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TABLE 1.—Mean dynamic height (geopotential) in units of 0.98 dynamic meters, temperature in degrees centigrade, and relative humidity in percent, for standard pressures, as obtained by radiosondes during December 1947—Continued

Standard pressure surface (mb.)	Oklahoma City, Okla. (972.8 mb.)				Omaha, Nebr. (982.0 mb.)				Phoenix, Ariz. (977.3 mb.)				Pittsburgh, Pa. (972.9 mb.)				Portland, Maine (1,012.2 mb.)				Rapid City, S. Dak. (902.5 mb.)				St. Cloud, Minn. (979.0 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface.....	31	391	4.5	77	31	308	-1.0	79	31	339	9.5	57	31	382	-0.7	71	31	20	-8.2	72	31	980	-2.1	71	31	317	-8.6	87
1,000.....	31	163	(*)	---	31	102	(*)	---	31	146	(*)	---	31	161	(*)	---	31	115	(*)	---	31	151	(*)	---	31	151	(*)	---
950.....	31	585	5.8	70	31	577	-1.7	81	31	581	12.9	43	31	576	-1.5	71	31	521	-6.0	67	31	567	(*)	---	31	553	-8.0	87
900.....	31	1,026	5.1	61	31	1,003	-1.5	68	31	1,029	10.2	42	31	1,001	-3.1	72	31	939	-7.5	70	31	1,002	(*)	---	31	970	-6.4	74
850.....	31	1,492	4.1	53	31	1,461	-1.3	56	31	1,502	6.7	44	31	1,452	-4.3	67	31	1,383	-9.1	70	31	1,460	-3	54	31	1,418	-5.7	56
800.....	31	1,984	2.5	46	31	1,945	-1.3	48	31	1,997	3.3	45	31	1,929	-5.2	61	31	1,851	-10.1	65	31	1,945	-1.8	54	31	1,893	-6.3	51
750.....	21	2,508	.5	42	31	2,463	-3.6	48	31	2,519	.0	46	31	2,442	-6.6	53	31	2,354	-11.8	59	31	2,459	-4.6	55	31	2,402	-8.0	51
700.....	31	3,055	-2.0	38	31	3,000	-6.5	47	31	3,067	-2.7	38	31	2,972	-8.6	49	31	2,874	-13.3	54	31	2,997	-7.4	53	31	2,929	-10.2	48
650.....	31	3,643	-5.0	35	31	3,582	-9.7	47	31	3,652	-6.2	---	31	3,553	-10.8	46	31	3,443	-15.8	51	31	3,575	-10.6	52	31	3,502	-13.1	47
600.....	29	4,266	-8.4	---	31	4,190	-13.0	46	31	4,273	-10.0	---	31	4,156	-14.0	52	31	4,035	-19.0	52	31	4,182	-14.3	54	31	4,104	-16.3	44
550.....	29	4,937	-12.6	---	31	4,851	-17.3	47	31	4,940	-14.4	---	31	4,820	-17.6	52	31	4,680	-22.7	---	31	4,837	-18.3	53	30	4,755	-19.8	---
500.....	29	5,656	-17.8	---	31	5,556	-22.0	---	31	5,654	-19.3	---	31	5,519	-21.9	---	30	5,373	-26.9	---	31	5,542	-23.2	---	30	5,457	-24.1	---
450.....	27	6,439	-23.5	---	31	6,329	-27.8	---	31	6,434	-25.2	---	31	6,295	-27.2	---	30	6,133	-32.3	---	31	6,310	-28.6	---	29	6,225	-29.3	---
400.....	26	7,284	-29.9	---	31	7,161	-33.7	---	30	7,286	-31.3	---	31	7,126	-32.7	---	30	6,947	-37.9	---	31	7,140	-34.5	---	28	7,061	-35.1	---
350.....	25	8,227	-36.3	---	31	8,084	-40.1	---	30	8,218	-38.5	---	30	8,046	-39.1	---	29	7,857	-43.1	---	31	8,060	-41.3	---	28	7,970	-41.7	---
300.....	17	9,291	-43.6	---	31	9,119	-47.7	---	29	9,253	-46.0	---	30	9,085	-45.7	---	27	8,885	-48.6	---	30	9,085	-48.6	---	28	9,008	-48.4	---
250.....	10	10,481	-51.1	---	31	10,304	-54.5	---	27	10,458	-53.1	---	29	10,288	-51.6	---	25	10,068	-51.7	---	30	10,269	-53.7	---	27	10,185	-54.7	---
200.....	---	---	---	---	24	11,734	-57.6	---	21	11,874	-57.2	---	28	11,725	-55.1	---	18	11,503	-53.4	---	28	11,691	-55.3	---	22	11,600	-55.0	---
175.....	---	---	---	---	14	12,597	-56.6	---	15	12,709	-57.5	---	26	12,574	-56.4	---	12	12,357	-52.2	---	24	12,527	-53.8	---	12	12,432	-52.6	---
150.....	---	---	---	---	8	13,560	-56.2	---	7	13,654	-56.9	---	13	13,521	-56.0	---	5	13,315	-53.1	---	11	13,522	-53.0	---	---	---	---	---
125.....	---	---	---	---	---	---	---	---	---	---	---	---	5	14,093	-57.9	---	---	---	---	---	---	---	---	---	---	---	---	

Standard pressure surface (mb.)	San Antonio, Tex. (990.4 mb.)				San Juan, P. R. (1,014.1 mb.)				Santa Maria, Calif. (1,010.5 mb.)				Sault Ste. Marie, Mich. (989.1 mb.)				Spokane, Wash. ¹ (934.6 mb.)				Swan Island, W. I. (1,011.8 mb.)				Tacubaya, Mexico (773.6 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface.....	31	240	11.0	76	31	15	24.2	81	31	71	9.7	74	31	221	-5.4	70	23	721	-0.1	87	19	10	26.3	81	31	2,306	13.0	62
1,000.....	31	158	(*)	---	31	137	23.6	80	31	158	11.0	67	31	134	(*)	---	31	168	(*)	---	19	114	25.6	80	31	84	(*)	---
950.....	31	592	11.6	70	31	589	20.7	82	31	589	10.7	52	31	539	-7.3	81	31	584	(*)	---	19	673	22.1	83	31	541	(*)	---
900.....	31	1,039	9.4	67	31	1,032	17.6	84	31	1,036	8.7	48	31	955	-9.3	84	31	1,015	-7	86	19	1,033	19.0	79	31	1,012	(*)	---
850.....	31	1,512	8.0	57	31	1,539	14.7	78	31	1,506	6.2	46	31	1,396	-10.4	79	31	1,470	-2.3	80	19	1,523	16.0	75	31	1,502	(*)	---
800.....	31	2,011	6.4	49	31	2,050	13.1	62	31	2,000	3.9	38	31	1,861	-11.9	75	31	1,950	-4.6	78	19	2,037	13.1	72	31	2,024	(*)	---
750.....	31	2,542	4.3	50	31	2,598	11.2	38	31	2,529	1.2	34	31	2,360	-13.2	69	31	2,462	-7.0	74	19	2,588	10.3	63	31	2,569	11.5	62
700.....	31	3,097	1.8	42	31	3,165	8.7	28	30	3,070	-1.9	31	31	2,877	-14.8	66	31	2,992	-9.6	71	19	3,149	7.6	---	31	3,139	7.4	66
650.....	31	3,688	-2.1	39	31	3,780	5.9	---	29	3,654	-5.3	---	30	3,444	-17.2	61	31	3,566	-12.7	68	19	3,761	4.5	---	31	3,746	2.8	74
600.....	31	4,322	-5.7	38	31	4,425	2.3	---	29	4,276	-9.2	---	30	4,034	-20.5	63	31	4,168	-16.2	69	19	4,404	.6	---	31	4,389	-1.9	75
550.....	31	4,995	-9.5	33	31	5,125	-1.8	---	29	4,946	-13.6	---	30	4,677	-23.7	---	31	4,822	-19.9	67	19	5,102	-3.5	---	31	5,076	-5.4	57
500.....	30	5,730	-14.4	40	31	5,873	-6.5	---	28	5,663	-18.2	---	30	5,364	-28.0	---	30	5,519	-24.5	---	19	5,844	-8.3	---	31	5,819	-10.1	53
450.....	30	6,527	-19.9	47	31	6,700	-12.1	---	27	6,451	-23.8	---	30	6,120	-32.6	---	30	6,283	-29.8	---	19	6,670	-13.1	---	31	6,629	-15.2	47
400.....	29	7,382	-25.9	---	31	7,580	-18.3	---	26	7,294	-29.9	---	30	6,935	-37.7	---	30	7,107	-36.0	---	18	7,542	-18.9	---	31	7,505	-21.5	---
350.....	29	8,336	-32.6	---	31	8,562	-25.8	---	25	8,233	-36.8	---	27	7,849	-43.5	---	28	8,033	-42.4	---	18	8,522	-26.3	---	31	8,475	-28.7	---
300.....	28	9,406	-39.7	---	31	9,660	-34.5	---	17	9,259	-43.8	---	19	8,899	-49.3	---	24	9,056	-49.1	---	16	9,620	-34.8	---	30	9,559	-37.3	---
250.....	26	10,634	-47.8	---	31	10,909	-44.0	---	9	10,454	-50.9	---	---	---	---	---	22	10,236	-54.4	---	14	10,866	-44.9	---	18	10,796	-47.8	---
200.....	16	12,096	-55.3	---	29	12,371	-54.5	---	---	---	---	---	---	---	---	---	16	11,649	-55.1	---	14	12,319	-56.4	---	---	---	---	---
150.....	9	12,980	-60.3	---	28	13,213	-60.1	---	---	---	---	---	---	---	---	---	11	12,495	-55.8	---	13	13,155	-62.0	---	---	---	---	---
125.....	6	13,951	-62.2	---	21	14,155	-66.1	---	---	---	---	---	---	---	---	---	---	---	---	---	9	14,093	-67.4	---	---	---	---	---
100.....	---	---	---	---	6	15,244	-70.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	

Standard pressure surface (mb.)	Tampa, Fla. (1,018.1 mb.)				Tatoosh Island, Wash. (1,012.5 mb.)				Toledo, Ohio (995.3 mb.)				Washington, D. C. (1,017.6 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface.....	31	9	16.0	84	31	31	7.4	87	31	191	-2.5	83	30	25	1.6	64
1,000.....	31	16														

TABLE 2.—Free-air resultant winds based on pilot balloon observations made near 5 p. m., E. S. T. (2200 G. C. T.) during December 1947. Directions given in degrees from north (N=360°, E=90°, S=180°, W=270°). Velocities in meters per second

Altitude (meters) m. s. l.	Abilene, Tex. (534 m.)			Albuquerque, N. Mex. (1,627 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (868 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (100 m.)			Charleston, S. C. (16 m.)			Cincinnati, Ohio (150 m.)			Denver, Colo. (1,618 m.)			El Paso, Tex. (1,198 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity			
Surface.....	29	247	1.4	31	261	1.3	25	173	0.3	30	242	4.4	28	302	0.6	31	8	0.7	27	130	2.1	29	258	3.7	29	243	1.1	27	346	0.9	26	239	1.8	30	60	0.9	31	257	1.2
500.....	29	225	2.5	31	261	1.3	25	168	1.4	30	242	4.4	28	302	0.6	31	8	0.7	27	140	3.3	29	251	5.4	29	265	4.2	27	284	1.6	26	237	3.0	30	60	0.9	31	257	1.2
1,000.....	29	225	2.5	31	261	1.3	25	168	1.4	30	242	4.4	28	302	0.6	31	8	0.7	27	140	3.3	29	251	5.4	29	265	4.2	27	284	1.6	26	237	3.0	30	60	0.9	31	257	1.2
1,500.....	27	234	4.4	31	261	1.3	25	168	1.4	30	242	4.4	28	302	0.6	31	8	0.7	27	181	2.8	29	258	8.6	29	265	4.2	27	261	3.2	25	253	6.5	30	60	0.9	31	257	1.2
2,000.....	27	245	5.2	31	242	1.7	22	282	4.1	30	257	10.1	23	295	7.1	31	23	3	19	219	2.9	15	269	10.6	20	293	9.4	23	268	6.0	22	276	9.5	30	60	0.9	31	257	1.2
2,500.....	26	248	6.4	30	266	2.6	18	285	6.8	28	292	11.5	19	300	11.1	27	275	5.2	17	228	4.6	10	273	12.6	11	310	14.7	21	273	9.2	20	280	14.2	28	284	2.6	31	257	1.2
3,000.....	23	262	7.5	29	267	4.0	16	282	7.8	26	291	12.2	16	290	12.5	25	278	7.2	17	232	4.2	10	276	15.1	10	305	17.2	21	273	10.7	19	276	15.2	28	284	2.6	31	257	1.2
4,000.....	21	251	8.5	25	290	7.7	14	270	12.3	23	295	12.8	15	290	15.7	20	292	10.5	15	242	7.0	10	276	15.1	10	305	17.2	21	273	10.7	19	276	15.2	28	284	2.6	31	257	1.2
5,000.....	19	257	9.7	23	282	11.2	13	276	18.3	21	302	13.9	13	291	14.9	16	301	13.1	14	245	10.5	10	276	15.1	10	305	17.2	21	273	10.7	19	276	15.2	28	284	2.6	31	257	1.2
6,000.....	18	243	13.0	20	295	12.0	13	273	21.5	19	304	14.1	15	291	14.9	16	301	13.1	14	245	10.5	10	276	15.1	10	305	17.2	21	273	10.7	19	276	15.2	28	284	2.6	31	257	1.2
8,000.....	18	243	13.0	20	295	12.0	13	273	21.5	19	304	14.1	15	291	14.9	16	301	13.1	14	245	10.5	10	276	15.1	10	305	17.2	21	273	10.7	19	276	15.2	28	284	2.6	31	257	1.2
10,000.....	18	243	13.0	20	295	12.0	13	273	21.5	19	304	14.1	15	291	14.9	16	301	13.1	14	245	10.5	10	276	15.1	10	305	17.2	21	273	10.7	19	276	15.2	28	284	2.6	31	257	1.2
12,000.....	18	243	13.0	20	295	12.0	13	273	21.5	19	304	14.1	15	291	14.9	16	301	13.1	14	245	10.5	10	276	15.1	10	305	17.2	21	273	10.7	19	276	15.2	28	284	2.6	31	257	1.2

Altitude (meters) m. s. l.	Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,475 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Joliet, Ill. (178 m.)			Las Vegas, Nev. (575 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (416 m.)			Miami, Fla. (12 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)			New York, N. Y. (15 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity			
Surface.....	30	252	0.2	31	303	1.0	27	247	1.1	26	248	4.0	26	11	1.5	25	245	1.6	31	33	1.6	30	53	0.3	28	311	0.6	31	93	1.7	29	19	0.7	30	221	1.2	28	299	4.2
500.....	30	252	0.2	31	303	1.0	27	247	1.1	26	248	4.0	26	11	1.5	25	245	1.6	31	33	1.6	30	53	0.3	28	311	0.6	31	93	1.7	29	19	0.7	30	221	1.2	28	299	4.2
1,000.....	30	252	0.2	31	303	1.0	27	247	1.1	26	248	4.0	26	11	1.5	25	245	1.6	31	33	1.6	30	53	0.3	28	311	0.6	31	93	1.7	29	19	0.7	30	221	1.2	28	299	4.2
1,500.....	30	252	0.2	31	303	1.0	27	247	1.1	26	248	4.0	26	11	1.5	25	245	1.6	31	33	1.6	30	53	0.3	28	311	0.6	31	93	1.7	29	19	0.7	30	221	1.2	28	299	4.2
2,000.....	30	252	0.2	31	303	1.0	27	247	1.1	26	248	4.0	26	11	1.5	25	245	1.6	31	33	1.6	30	53	0.3	28	311	0.6	31	93	1.7	29	19	0.7	30	221	1.2	28	299	4.2
2,500.....	30	252	0.2	31	303	1.0	27	247	1.1	26	248	4.0	26	11	1.5	25	245	1.6	31	33	1.6	30	53	0.3	28	311	0.6	31	93	1.7	29	19	0.7	30	221	1.2	28	299	4.2
3,000.....	30	348	1.4	31	302	1.0	26	249	2.0	25	255	8.9	23	260	3.0	18	265	3.2	31	37	2.7	25	261	2.4	24	213	3.9	30	304	1.4	23	260	1.1	22	262	1.3	21	263	1.4
4,000.....	28	319	3.1	31	302	1.0	26	249	2.0	25	255	8.9	23	260	3.0	18	265	3.2	31	37	2.7	25	261	2.4	24	213	3.9	30	304	1.4	23	260	1.1	22	262	1.3	21	263	1.4
5,000.....	25	312	6.9	31	302	1.0	26	249	2.0	25	255	8.9	23	260	3.0	18	265	3.2	31	37	2.7	25	261	2.4	24	213	3.9	30	304	1.4	23	260	1.1	22	262	1.3	21	263	1.4
6,000.....	17	314	8.6	31	302	1.0	26	249	2.0	25	255	8.9	23	260	3.0	18	265	3.2	31	37	2.7	25	261	2.4	24	213	3.9	30	304	1.4	23	260	1.1	22	262	1.3	21	263	1.4
8,000.....	14	319	11.1	31	302	1.0	26	249	2.0	25	255	8.9	23	260	3.0	18	265	3.2	31	37	2.7	25	261	2.4	24	213	3.9	30	304	1.4	23	260	1.1	22	262	1.3	21	263	1.4
10,000.....	10	320	11.1	31	302	1.0	26	249	2.0	25	255	8.9	23	260	3.0	18	265	3.2	31	37	2.7	25	261	2.4	24	213	3.9	30	304	1.4	23	260	1.1	22	262	1.3	21	263	1.4

Altitude (meters) m. s. l.	Oakland, Calif. (8 m.)			Oklahoma City, Okla. (396 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			St. Cloud, Minn. (318 m.)			San Antonio, Tex. (240 m.)			San Diego, Calif. (13 m.)			Sault Ste. Marie, Mich. (225 m.)			Seattle, Wash. (116 m.)			Spokane, Wash. (725 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity			
Surface.....	31	257	1.7	25	224	1.3	29	317	2.2	31	171	0.5	31	345	2.8	29	228	1.4	27	281	1.0	30	346	0.9	31	280	2.5	21	292	0.8	23	186	1.6	24	197	0.8	30	294	2.4
500.....	31	341	1.7	25	322	1.5	29	305	2.6	31	189	0.7	29	334	2.9	25	239	3.3	27	297	1.8	30	320	0.7	31	302	2.1	21	270	1.4	23	196	3.8	24	188	3.1	29	287	4.9
1,000.....	30	346	3.1	23	337	3.6	26	297	4.0	31	187	0.6	31	344	2.9	25	249	7.0	26	297	4.1	30	342	1.1	28	3	1.5	16	259	2.2	19	208	5.7	24	188	3.1	29	287	4.9
1,500.....	28	335	3.3	23	346	6.4	26	289	6.2	31	179	0.6	31	304	5.2	21	263	9.5	19	301	9.3	26	264	2.6	26	18	3.5	15	209	6.0	21	223	6.4	28	290	9.4			
2,000.....	26	340	4.6	23	350	8.6	25	288	8.0	30	350	0.5	30	295	7.2	21	274	10.9	19	297	11.0	25	267	4.6	26	2	4.3	11	225	5.1	16	233	7.6	27	293	12.3			
2,500.....	25	326	5.4	23	352	8.6	24	286	9.6	29	329	1.6	28	306	9.4	20	276	10.3	19	281	16.7	22	267	4.2	26	2	4.3	11	225	5.1	16	233	7.6	27	293	12.3			
3,000.....	23	323	7.0	22	360	8.5	24	282	10.1	27	337	3.6	26	305	11.1	19	278																						

AEROLOGICAL OBSERVATIONS FOR THE YEAR 1947

TABLE 1A.—Mean dynamic height (geopotential) in units of 0.98 dynamic meters, temperature in degrees centigrade, and relative humidity in percent, for standard pressures, as obtained by radiosondes during the year 1947

STATIONS AND MEAN SURFACE PRESSURES

Standard pressure surface (mb.)	Albany, N. Y. (1,005.4 mb.)				Albuquerque, N. Mex. (836.8 mb.)				Apalachicola, Fla. (1,016.9 mb.)				Atlanta, Ga. (983.0 mb.)				Auburn, Calif. (957.2 mb.)				Big Spring, Tex. (926.5 mb.)				Bismarck, N. Dak. (954.9 mb.)				
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	
Surface.....	356	86	7.0	70	365	1,620	15.9	34	362	5	19.4	83	365	300	14.8	74	364	501	15.5	56	363	774	17.2	51	365	505	5.9	72	
1,000.....	356	130	(*)	---	365	81	(*)	---	362	150	19.8	79	365	154	(*)	---	364	126	(*)	---	363	113	(*)	---	365	122	(*)	---	
950.....	356	556	6.2	73	365	533	(*)	---	362	594	17.7	71	365	593	15.1	67	364	568	16.4	52	363	559	(*)	---	365	548	(*)	---	
900.....	356	995	3.9	75	365	1,001	(*)	---	362	1,052	15.5	66	365	1,047	13.0	66	364	1,024	14.5	45	363	1,021	17.4	48	365	989	5.1	64	
850.....	356	1,458	1.8	74	365	1,486	(*)	---	361	1,535	13.1	61	365	1,526	10.5	64	364	1,504	11.5	44	363	1,508	14.7	47	365	1,454	3.2	64	
800.....	356	1,945	---	70	365	1,999	13.3	34	361	2,043	10.6	56	365	2,029	8.1	59	364	2,007	8.2	41	363	2,018	12.1	45	365	1,944	1.0	61	
750.....	355	2,466	---	64	365	2,544	9.4	37	361	2,584	7.9	52	365	2,565	5.5	53	364	2,541	4.8	42	363	2,558	8.8	44	365	2,465	---	58	
700.....	354	3,006	---	61	365	3,106	5.1	42	361	3,145	4.9	48	365	3,121	2.7	50	363	3,095	1.3	---	363	3,124	5.2	42	365	3,008	---	55	
650.....	351	3,500	---	57	365	3,709	---	5	47	360	3,750	1.8	46	364	3,722	---	46	362	3,689	---	---	362	3,726	1.4	39	365	3,593	---	63
600.....	349	4,205	---	53	365	4,343	---	4.3	50	356	4,387	---	50	361	4,354	---	---	360	4,318	---	---	361	4,364	---	---	365	4,207	---	51
550.....	346	4,872	---	---	360	5,023	---	9.1	52	355	5,075	---	---	359	5,036	---	---	360	4,993	---	---	356	5,048	---	---	360	4,872	---	50
500.....	342	5,585	---	---	360	5,783	---	14.1	52	354	5,814	---	---	358	5,769	---	---	360	5,720	---	---	352	5,784	---	---	356	5,585	---	60
450.....	340	6,368	---	---	359	6,550	---	19.5	---	352	6,624	---	---	357	6,572	---	---	357	6,511	---	---	342	6,590	---	---	351	6,368	---	---
400.....	337	7,211	---	---	356	7,409	---	25.4	---	348	7,495	---	---	355	7,437	---	---	356	7,364	---	---	339	7,455	---	---	341	7,206	---	---
350.....	329	8,149	---	---	353	8,364	---	32.4	---	345	8,464	---	---	351	8,397	---	---	352	8,310	---	---	333	8,417	---	---	334	8,141	---	---
300.....	314	9,204	---	---	345	9,434	---	40.1	---	341	9,550	---	---	345	9,471	---	---	347	9,368	---	---	313	9,491	---	---	314	9,190	---	---
250.....	307	10,411	---	---	325	10,658	---	48.2	---	335	10,785	---	---	342	10,697	---	---	341	10,573	---	---	290	10,725	---	---	256	10,403	---	---
200.....	273	11,848	---	---	245	12,107	---	55.1	---	324	12,233	---	---	327	12,138	---	---	313	11,996	---	---	240	12,180	---	---	---	---	---	---
175.....	229	12,682	---	---	151	12,973	---	57.3	---	297	13,072	---	---	282	12,974	---	---	262	12,837	---	---	185	13,056	---	---	---	---	---	---
150.....	185	13,658	---	---	---	---	---	---	---	245	14,021	---	---	189	13,925	---	---	200	13,789	---	---	---	---	---	---	---	---	---	---
125.....	---	---	---	---	---	---	---	---	---	141	15,127	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Standard pressure surface (mb.)	Boise, Idaho (915.6 mb.)				Brownsville, Tex. (1,013.7 mb.)				Buffalo, N. Y. (989.5 mb.)				Caribou, Maine (990.4 mb.)				Charleston, S. C. (1,016.0 mb.)				Ciudad Victoria, Mexico (974.3 mb.)				Columbia, Mo. (988.0 mb.)				
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	
Surface.....	364	868	11.9	57	364	6	21.6	82	357	221	7.6	78	365	191	2.7	82	363	13	16.0	85	350	335	24.0	61	361	239	12.2	69	
1,000.....	364	119	(*)	---	364	124	21.4	81	357	133	(*)	---	365	112	(*)	---	363	148	17.0	79	350	104	(*)	---	361	136	(*)	---	
950.....	364	559	(*)	---	364	573	19.3	76	357	590	7.1	71	365	531	3.0	74	363	590	15.9	71	350	556	22.6	60	361	571	11.8	64	
900.....	364	1,011	13.0	50	364	1,032	17.7	63	357	1,060	4.8	71	365	966	---	74	363	1,045	13.6	68	350	1,023	19.1	64	361	1,019	9.7	64	
850.....	364	1,489	10.1	45	364	1,530	15.8	55	357	1,464	2.3	70	365	1,424	---	72	363	1,525	11.1	65	350	1,512	15.8	68	361	1,492	7.5	62	
800.....	364	1,990	6.6	51	364	2,034	13.6	48	357	1,952	---	67	365	1,907	---	69	363	2,029	8.6	59	350	2,025	13.0	69	361	1,990	5.5	56	
750.....	364	2,518	3.0	53	364	2,580	11.2	42	357	2,475	---	61	365	2,421	---	63	363	2,568	6.0	52	350	2,571	10.4	64	360	2,521	8.1	52	
700.....	364	3,071	---	56	364	3,148	8.0	39	357	3,014	---	56	365	2,957	---	60	362	3,124	3.2	51	349	3,139	7.6	56	360	3,072	---	49	
650.....	364	3,650	---	56	360	3,759	4.4	38	356	3,690	---	53	365	3,536	---	57	359	3,725	---	---	345	3,745	3.9	52	356	3,667	---	47	
600.....	364	4,283	---	54	360	4,402	---	---	353	4,216	---	51	359	4,144	---	56	354	4,358	---	---	339	4,392	---	---	354	4,293	---	45	
550.....	364	4,951	---	53	356	5,096	---	4.0	---	348	4,883	---	---	355	4,803	---	54	348	5,043	---	---	336	5,083	---	---	350	4,968	---	---
500.....	361	5,671	---	51	354	5,840	---	8.7	---	343	5,597	---	---	352	5,511	---	---	343	5,778	---	---	331	5,829	---	---	345	5,693	---	---
450.....	361	6,455	---	---	352	6,657	---	14.0	---	338	6,382	---	---	350	6,286	---	---	343	6,585	---	---	324	6,645	---	---	341	6,488	---	---
400.....	360	7,300	---	---	346	7,533	---	20.0	---	332	7,222	---	---	342	7,124	---	---	330	7,451	---	---	316	7,525	---	---	340	7,341	---	---
350.....	359	8,237	---	---	344	8,510	---	26.9	---	324	8,160	---	---	333	8,056	---	---	327	8,414	---	---	311	8,502	---	---	335	8,291	---	---
300.....	351	9,287	---	---	337	9,602	---	35.0	---	312	9,212	---	---	320	9,101	---	---	321	9,493	---	---	307	9,594	---	---	324	9,358	---	---
250.....	333	10,486	---	---	329	10,849	---	44.3	---	288	10,430	---	---	298	10,307	---	---	311	10,726	---	---	286	10,842	---	---	288	10,580	---	---
200.....	287	11,911	---	---	298	12,311	---	54.3	---	245	11,860	---	---	229	11,742	---	---	289	12,169	---	---	225	12,298	---	---	225	12,019	---	---
175.....	211	12,743	---	---	234	13,157	---	58.9	---	196	12,702	---	---	168	12,648	---	---	229	13,012	---	---	129	13,149	---	---	168	12,872	---	---
150.....	121	13,741	---	---	145	14,118	---	63.3	---	---	---	---	---	---	---	---	---	146	13,956	---	---	---	---	---	---	---	---	---	---
125.....	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Standard pressure surface (mb.)	Dodge City, Kans. (924.3 mb.)				El Paso, Tex. (880.8 mb.)				Ely, Nev. (808.7 mb.)				Fort Worth, Tex. (991.1 mb.)				Glasgow, Mont. (938.8 mb.)				Grand Junction, Colo. (849.7 mb.)				Great Falls, Mont. (886.1 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface.....	363	787	11.4	64	364	1,195	18.3	33	363	1,908	8.2	53	365	211	18.2	61	364	648	6.4	65	363	1,474	11.5	50	364	1,128	7.7	55
1,000.....	363	119	(*)	---	364	88	(*)	---	363	108	(*)	---	365	132	(*)	---	364	122	(*)	---	363	106	(*)	---	364	115	(*)	---
950.....	363	558	(*)	---	364	544	(*)	---	363	553	(*)	---	365	577														

TABLE 1A.—Mean dynamic height (geopotential) in units of 0.98 dynamic meters, temperature in degrees centigrade, and relative humidity in percent, for standard pressures, as obtained by radiosondes during the year 1947—Continued

Standard pressure surface (mb.)	Greensboro, N. C. (986.0 mb.)				Hatteras, N. C. (1,017.1 mb.)				Havana, Cuba ¹ (.....mb.)				Honolulu, T. H. (1,015.0 mb.)				Huntington, W. Va. (997.3 mb.)				International Falls, Minn. (973.4 mb.)				Joliet, Ill. (995.0 mb.)			
	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity
Surface.....	365	273	12.2	76	360	3	16.3	82	.....	.....	.....	.....	362	3	26.0	63	355	172	10.4	80	362	360	2.5	77	362	178	8.1	80
1,000.....	365	154	(*)	.....	360	148	16.1	77	.....	.....	.....	.....	362	134	24.1	65	355	149	(*)	.....	362	139	(*)	.....	362	135	(*)	.....
950.....	365	589	12.7	66	360	587	14.1	70	.....	.....	.....	.....	362	584	20.4	71	355	582	10.8	70	362	558	3.0	72	362	563	8.2	71
900.....	365	1,039	10.8	66	360	1,038	11.7	65	.....	.....	.....	.....	362	1,046	16.9	75	355	1,027	8.1	71	362	993	.....	72	362	1,006	6.2	68
850.....	365	1,514	7.9	66	360	1,515	10.0	61	.....	.....	.....	.....	362	1,532	14.0	72	355	1,498	5.6	69	362	1,452	.....	70	362	1,474	4.3	63
800.....	365	2,012	5.5	63	360	2,016	7.0	56	.....	.....	.....	.....	362	2,043	12.6	52	355	1,992	3.3	66	362	1,935	.....	65	362	1,966	2.3	60
750.....	365	2,542	2.8	61	360	2,549	4.5	51	.....	.....	.....	.....	362	2,588	10.7	38	355	2,518	1.0	59	362	2,450	.....	61	362	2,490	.....	56
700.....	365	3,094	.....	55	359	3,104	1.9	49	.....	.....	.....	.....	361	3,155	8.0	.....	354	3,066	.....	55	361	2,986	.....	58	360	3,036	.....	51
650.....	363	3,688	.....	50	359	3,701	.....	.....	.....	.....	.....	.....	360	3,766	4.9	.....	353	3,656	.....	52	360	3,564	.....	54	359	3,625	.....	48
600.....	362	4,315	.....	45	356	4,332	.....	.....	.....	.....	.....	.....	356	4,411	1.8	.....	353	4,278	.....	51	359	4,173	.....	50	358	4,243	.....	45
550.....	361	4,992	.....	40	349	5,014	.....	.....	.....	.....	.....	.....	353	5,108	.....	.....	350	4,951	.....	54	354	4,831	.....	51	355	4,913	.....	48
500.....	359	5,719	.....	34	349	5,744	.....	.....	.....	.....	.....	.....	347	5,856	.....	.....	347	5,673	.....	50	349	5,538	.....	50	353	5,630	.....	45
450.....	357	6,516	.....	31	341	6,544	.....	.....	.....	.....	.....	.....	345	6,676	.....	.....	346	6,462	.....	53	343	6,311	.....	50	352	6,416	.....	40
400.....	356	7,373	.....	28	341	7,406	.....	.....	.....	.....	.....	.....	332	7,553	.....	.....	337	7,316	.....	53	336	7,146	.....	50	351	7,263	.....	35
350.....	356	8,325	.....	25	332	8,365	.....	.....	.....	.....	.....	.....	325	8,531	.....	.....	331	8,264	.....	53	326	8,074	.....	50	345	8,203	.....	30
300.....	349	9,394	.....	22	328	9,439	.....	.....	.....	.....	.....	.....	315	9,625	.....	.....	319	9,324	.....	53	306	9,110	.....	50	337	9,259	.....	25
250.....	338	10,612	.....	19	304	10,669	.....	.....	.....	.....	.....	.....	304	10,876	.....	.....	302	10,543	.....	53	277	10,310	.....	50	308	10,473	.....	20
200.....	299	12,047	.....	16	273	12,107	.....	.....	.....	.....	.....	.....	275	12,350	.....	.....	263	11,966	.....	53	189	11,778	.....	50	262	11,918	.....	15
175.....	259	12,882	.....	13	202	12,940	.....	.....	.....	.....	.....	.....	236	13,201	.....	.....	224	12,826	.....	53	129	12,650	.....	50	204	12,769	.....	10
150.....	194	13,831	.....	11	116	13,895	.....	.....	.....	.....	.....	.....	169	14,162	.....	.....	171	13,784	.....	53	.....	.....	.....	.....	.....	.....	.....	5
125.....	109	14,755	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0

Standard pressure surface (mb.)	Lake Charles, La. (1,016.1 mb.)				Lander, Wyo. (828.2 mb.)				Las Vegas, Nev. (945.7 mb.)				Little Rock, Ark. (1,007.3 mb.)				Mazatlan, Mexico (1,009.1 mb.)				Medford, Oreg. (969.6 mb.)				Merida, Mexico (1,010.3 mb.)			
	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity
Surface.....	364	5	18.3	83	364	1,696	6.7	57	363	574	21.5	28	360	79	15.5	72	356	14	24.8	75	365	401	14.5	62	357	27	26.4	74
1,000.....	364	141	18.8	76	364	112	(*)	.....	363	83	(*)	.....	360	140	16.9	66	356	94	24.1	72	365	138	(*)	.....	357	118	25.6	74
950.....	364	586	16.8	70	364	552	(*)	.....	363	533	(*)	.....	360	580	15.3	62	356	546	22.4	57	365	578	14.5	58	357	570	22.8	73
900.....	364	1,044	15.0	65	364	1,007	(*)	.....	363	1,002	20.6	26	360	1,033	12.8	63	356	1,012	20.7	55	365	1,027	11.7	57	357	1,038	19.9	73
850.....	364	1,524	12.9	59	364	1,480	(*)	.....	363	1,491	16.6	28	360	1,512	10.6	60	356	1,504	17.9	51	365	1,503	8.3	61	357	1,530	16.8	72
800.....	364	2,032	10.6	55	364	1,981	7.6	49	363	2,003	12.4	32	360	2,015	8.4	54	356	2,020	14.8	.....	365	2,000	4.9	63	357	2,042	13.8	69
750.....	364	2,573	7.9	49	364	2,514	4.2	49	363	2,543	8.0	34	360	2,551	5.9	50	356	2,569	11.6	.....	365	2,528	1.7	61	357	2,591	10.9	64
700.....	364	3,124	5.1	44	364	3,068	.....	52	363	3,104	3.6	38	360	3,108	3.0	47	354	3,137	7.9	.....	365	3,077	.....	56	357	3,160	8.1	55
650.....	361	3,739	1.6	41	364	3,660	.....	56	363	3,702	.....	41	357	3,709	.....	46	349	3,746	3.9	.....	365	3,667	.....	49	354	3,771	4.8	49
600.....	361	4,376	.....	36	364	4,284	.....	58	363	4,334	.....	42	355	4,342	.....	.....	346	4,391	.....	.....	363	4,289	.....	55	348	4,417	.....	44
550.....	361	5,063	.....	31	364	4,955	.....	55	363	5,013	.....	9.8	345	5,025	.....	.....	337	5,083	.....	.....	362	4,959	.....	72	346	5,111	.....	38
500.....	360	5,800	.....	26	362	5,674	.....	56	363	5,741	.....	14.8	338	5,757	.....	.....	333	5,826	.....	.....	362	5,680	.....	74	345	5,861	.....	34
450.....	360	6,609	.....	21	357	6,458	.....	55	362	6,535	.....	20.4	335	6,560	.....	.....	330	6,643	.....	.....	362	6,464	.....	73	340	6,681	.....	29
400.....	359	7,476	.....	18	355	7,303	.....	53	361	7,391	.....	26.8	331	7,422	.....	.....	326	7,518	.....	.....	361	7,313	.....	70	333	7,564	.....	24
350.....	357	8,441	.....	15	352	8,240	.....	51	359	8,340	.....	34.2	321	8,382	.....	.....	306	8,493	.....	.....	360	8,265	.....	68	327	8,544	.....	19
300.....	354	9,522	.....	12	345	9,284	.....	48	357	9,400	.....	42.1	303	9,459	.....	.....	295	9,573	.....	.....	358	9,304	.....	66	321	9,638	.....	14
250.....	347	10,755	.....	9	336	10,487	.....	45	347	10,614	.....	50.4	282	10,688	.....	.....	266	10,829	.....	.....	352	10,504	.....	64	303	10,884	.....	9
200.....	322	12,204	.....	6	284	11,907	.....	42	311	12,042	.....	57.0	215	12,130	.....	.....	.....	.....	.....	.....	326	11,926	.....	61	201	12,343	.....	4
175.....	280	13,052	.....	3	221	12,749	.....	37	260	12,885	.....	58.6	.....	.....	.....	.....	.....	.....	.....	.....	297	12,763	.....	58	.....	.....	.....	0
150.....	204	14,024	.....	0	150	13,720	.....	37.6	171	13,840	.....	59.3	.....	.....	.....	.....	.....	.....	.....	.....	210	13,739	.....	57.9	.....	.....	.....	0
125.....	114	15,151	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0

Standard pressure surface (mb.)	Miami, Fla. (1,016.6 mb.)				Nantucket, Mass. (1,014.4 mb.)				Nashville, Tenn. (996.2 mb.)				New Orleans, La. (1,016.6 mb.)				North Platte, Nebr. (917.1 mb.)				Oakland, Calif. (1,015.8 mb.)				Ogden, Utah (864.4 mb.)			
	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity	Number of obser- vations	Dynamic height	Temperature	Relative humidity
Surface.....	363	4	22.7	82	350	14	8.5	84	363	180	14.1	72	359	2	19													

TABLE 1A.—Mean dynamic height (geopotential) in units of 0.98 dynamic meters, temperature in degrees centigrade, and relative humidity in percent, for standard pressures, as obtained by radiosondes during the year 1947—Continued

Standard pressure surface (mb.)	Oklahoma City, Okla. (969.7 mb.)				Omaha, Nebr. (979.4 mb.)				Phoenix, Ariz. (971.7 mb.)				Pittsburgh, Pa. (971.5 mb.)				Portland, Maine (1,012.6 mb.)				Rapid City, S. Dak. (902.2 mb.)				St. Cloud, Minn. ¹ (981.4 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	357	391	14.8	67	363	308	11.1	70	364	339	22.8	38	361	382	9.8	72	363	30	5.8	79	365	980	6.6	68	359	317	6.4	75
1,000	357	127	(*)	61	363	181	(*)	67	364	86	(*)	67	361	143	(*)	71	363	122	(*)	70	365	119	(*)	66	359	123	(*)	71
950	357	564	15.5	61	363	564	10.3	67	364	540	24.7	30	361	577	9.2	70	363	549	6.4	68	365	532	(*)	66	359	550	6.1	70
900	357	1,022	13.6	58	363	1,010	8.4	65	364	1,007	21.2	30	361	1,018	7.0	71	363	980	4.2	68	365	1,000	(*)	66	359	987	4.3	70
850	357	1,502	11.2	58	363	1,481	6.5	64	364	1,498	17.2	33	361	1,488	4.5	70	363	1,450	2.1	68	365	1,471	7.1	58	359	1,451	2.5	68
800	357	2,006	9.0	53	363	1,977	4.4	61	364	2,011	13.0	37	361	1,978	2.2	65	363	1,938	1.2	62	365	1,968	4.4	60	359	1,940	4.0	60
750	357	2,542	6.4	48	363	2,505	1.8	57	364	2,554	8.7	40	361	2,505	1.2	59	363	2,480	2.0	58	365	2,494	1.5	60	358	2,462	1.6	55
700	357	3,102	3.2	45	363	3,054	1.1	53	364	3,116	4.7	40	359	3,048	2.8	54	363	3,000	4.5	54	364	3,043	1.7	58	358	3,003	4.3	52
650	354	3,701	1.4	42	360	3,646	4.5	50	364	3,720	7.7	35	358	3,639	5.6	51	362	3,585	7.6	54	363	3,633	5.3	56	356	3,549	7.4	52
600	349	4,335	4.3	35	358	4,268	8.3	48	362	4,353	3.7	35	356	4,256	9.0	48	360	4,200	10.9	363	4,254	9.1	55	356	4,205	11.0	51	
550	346	5,016	8.6	35	356	4,941	12.5	48	361	5,038	8.4	35	356	4,929	12.9	35	359	4,865	14.6	360	4,923	13.4	54	361	4,870	15.0	50	
500	341	5,748	13.5	35	354	5,661	17.3	35	360	5,768	13.4	35	355	5,645	17.2	35	359	5,579	19.1	359	5,641	18.1	53	350	5,584	19.5	50	
450	325	6,546	19.0	32	352	6,448	22.7	35	358	6,570	19.1	35	354	6,437	22.4	35	355	6,362	24.3	349	6,427	23.4	53	344	6,366	24.7	50	
400	311	7,408	25.2	32	351	7,297	28.8	35	354	7,429	25.4	35	354	7,284	28.3	35	352	7,206	30.1	349	7,273	29.4	55	339	7,209	30.5	50	
350	297	8,364	32.0	34	347	8,259	35.4	35	352	8,384	32.6	35	352	8,227	35.0	35	352	8,147	36.7	344	8,214	36.4	54	334	8,145	37.2	50	
300	262	9,444	39.5	34	341	9,296	42.9	35	338	9,453	40.6	35	347	9,289	42.1	34	346	9,193	43.8	334	9,268	43.8	54	328	9,192	44.4	50	
250	246	10,666	47.6	34	334	10,507	50.3	35	314	10,678	49.1	35	343	10,504	49.4	35	331	10,401	50.8	307	10,482	51.1	54	314	10,394	51.1	50	
200	139	12,133	54.8	28	289	11,942	55.6	26	261	12,118	56.7	26	320	11,945	55.7	28	281	11,839	55.7	224	11,930	55.7	54	254	11,837	54.5	50	
175	108	12,976	57.3	23	235	12,791	58.7	19	197	12,951	58.7	19	283	12,792	57.5	24	244	12,683	56.7	142	12,804	55.8	54	196	12,682	54.4	50	
150					179	13,759	58.0						215	13,762	58.5		206	13,652	57.3									

Standard pressure surface (mb.)	San Antonio, Tex. (987.2 mb.)				San Juan, P. R. (1,014.7 mb.)				Santa Maria, Calif. (1,007.6 mb.)				Sault Ste. Marie, Mich. (983.1 mb.)				Spokane, Wash. ² (944.1 mb.)				Swan Island, W. I. (1,012.7 mb.)				Tacubaya, Mexico (774.0 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	357	240	19.0	68	359	15	25.2	81	362	71	13.6	76	364	221	4.0	80	357	721	11.2	61	340	10	26.2	81	341	2,306	15.8	60
1,000	357	128	(*)	65	359	144	24.2	81	362	135	13.5	74	364	122	(*)	73	365	123	(*)	68	340	122	25.5	82	341	64	(*)	60
950	357	573	18.8	65	359	595	20.9	83	362	574	14.0	59	364	547	4.0	73	365	558	(*)	68	340	577	22.1	83	341	826	(*)	60
900	357	1,034	16.5	66	359	1,059	17.8	82	362	1,023	14.3	43	364	980	2.2	71	365	1,006	9.5	68	340	1,041	19.2	78	341	1,003	(*)	60
850	357	1,519	14.2	64	359	1,546	14.9	78	362	1,504	12.6	39	364	1,440	1.3	69	365	1,477	6.2	66	340	1,532	16.8	62	341	1,497	(*)	60
800	357	2,029	11.9	57	358	2,058	12.5	66	362	2,010	10.0	35	364	1,925	1.7	65	365	1,972	2.9	62	340	2,046	13.8	64	341	2,025	(*)	60
750	357	2,570	9.4	48	357	2,602	10.3	52	362	2,550	7.1	31	364	2,443	3.9	62	365	2,497	5.5	65	340	2,594	10.9	58	341	2,576	13.9	61
700	357	3,137	6.4	41	357	3,170	7.7	36	361	3,107	4.0	30	364	2,979	6.4	58	365	3,040	3.9	65	339	3,161	8.0	49	341	3,152	9.5	66
650	350	3,742	2.6	39	353	3,779	4.6	35	362	3,709	4.0	35	362	3,592	9.2	56	364	3,525	7.4	60	337	3,618	4.7	50	341	3,765	4.9	73
600	348	4,383	1.3	34	349	4,425	1.0	35	357	4,343	3.2	35	360	4,171	12.7	54	364	4,240	11.2	58	334	4,278	1.0	50	341	4,412	4.7	77
550	339	5,072	5.6	35	348	5,118	3.0	35	353	5,028	7.5	35	355	4,834	16.4	62	364	4,904	15.3	56	332	5,114	2.9	50	337	5,107	3.8	69
500	331	5,812	10.4	34	344	5,867	7.6	35	350	5,761	12.5	35	349	5,542	20.7	53	359	5,616	20.0	56	331	5,862	7.3	50	334	5,853	8.2	62
450	327	6,621	15.8	34	340	6,689	12.9	34	347	6,564	18.3	35	346	6,323	25.8	35	356	6,396	25.3	357	6,684	12.3	35	330	6,673	13.0	60	
400	318	7,492	21.8	33	339	7,567	19.0	34	342	7,425	24.7	35	339	7,157	31.5	35	347	7,236	31.3	332	7,566	18.2	35	328	7,554	18.8	50	
350	307	8,461	28.8	33	338	8,547	26.3	33	332	8,382	32.0	35	321	8,088	38.1	34	347	8,169	38.2	321	8,549	25.2	35	323	8,535	26.1	50	
300	288	9,546	36.5	33	333	9,642	34.7	32	312	9,452	39.9	35	269	9,137	44.6	35	336	9,229	45.6	310	9,649	33.2	35	314	9,630	34.1	50	
250	275	10,786	45.2	32	322	10,890	44.2	32	242	10,679	48.2	35				324	10,406	52.8	310	10,900	45.8	54	310	10,883	44.4	50		
200	243	12,246	54.3	30	306	12,350	55.0	30	148	12,162	55.5	35				324	11,827	56.5	306	12,362	55.3	54	306	12,362	55.3	50		
175	201	13,095	58.6	27	278	13,193	60.8	27								237	12,668	55.8	279	13,201	61.7	54						

Standard pressure surface (mb.)	Tampa, Fla. (1,016.5 mb.)				Tatoosh Island, Wash. (1,013.2 mb.)				Toledo, Ohio (993.3 mb.)				Washington, D. C. (1,015.0 mb.)			
	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity	Number of observations	Dynamic height	Temperature	Relative humidity
Surface	364	9	20.5	84	365	31	9.8	86	365	191	8.4	80	363	25	12.6	70
1,000	364	150	20.6	81	365	140	8.6	76	365	134	(*)	72	363	149	12.1	61
950	364	596	18.7	76	365	567	8.1	76	365	562	7.9	72	363			

TABLE 2A.—Free-air resultant winds based on pilot balloon observations made near 5 p. m., E. S. T. (2200 G. C.) during year, 1947. Directions given in degrees from north (N=360°, E=90°, S=180°, W=270°). Velocities in meter per second

Altitude (meters) m.s.l.	Abilene, Tex. (534 m.)			Albuquerque, N. Mex. (1,627 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (863 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (100 m.)			Charleston, S. C. (16 m.)			Cincinnati, Ohio (276 m.)			Denver, Colo. (1,618 m.)			El Paso, Tex. (1,198 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity			
Surface.....	350	170	2.1	364	249	2.4	323	281	1.7	356	279	1.6	354	290	1.8	361	321	2.6	350	118	4.0	332	245	3.4	324	228	1.2	337	200	0.9	342	246	1.7	353	18	0.7	364	236	2.0
500.....	350	181	3.1	364	249	2.4	323	285	2.9	356	279	1.6	354	290	1.8	361	319	2.7	349	126	5.1	332	247	4.8	324	228	1.2	337	202	1.9	342	242	2.5	353	18	0.7	364	236	2.0
1,000.....	350	181	3.1	364	249	2.4	323	285	2.9	356	279	1.6	354	290	1.8	361	319	2.7	349	126	5.1	332	247	4.8	324	228	1.2	337	202	1.9	342	242	2.5	353	18	0.7	364	236	2.0
1,500.....	335	199	3.4	364	249	2.4	323	285	2.9	356	279	1.6	354	290	1.8	361	319	2.7	349	126	5.1	332	247	4.8	324	228	1.2	337	202	1.9	342	242	2.5	353	18	0.7	364	236	2.0
2,000.....	322	220	4.7	363	254	2.5	323	285	2.9	356	279	1.6	354	290	1.8	361	319	2.7	349	126	5.1	332	247	4.8	324	228	1.2	337	202	1.9	342	242	2.5	353	18	0.7	364	236	2.0
2,500.....	307	225	4.7	363	254	2.5	323	285	2.9	356	279	1.6	354	290	1.8	361	319	2.7	349	126	5.1	332	247	4.8	324	228	1.2	337	202	1.9	342	242	2.5	353	18	0.7	364	236	2.0
3,000.....	285	249	5.5	361	261	2.6	323	285	2.9	356	279	1.6	354	290	1.8	361	319	2.7	349	126	5.1	332	247	4.8	324	228	1.2	337	202	1.9	342	242	2.5	353	18	0.7	364	236	2.0
4,000.....	246	272	8.6	310	274	8.5	196	284	10.6	227	283	12.3	203	285	12.0	230	268	7.4	196	259	4.3	212	276	6.8	217	276	6.8	212	276	6.8	212	276	6.8	212	276	6.8	212	276	6.8
5,000.....	224	270	9.9	295	273	10.4	235	271	11.6	227	283	12.3	203	285	12.0	230	268	7.4	196	259	4.3	212	276	6.8	217	276	6.8	212	276	6.8	212	276	6.8	212	276	6.8	212	276	6.8
6,000.....	224	270	9.9	295	273	10.4	235	271	11.6	227	283	12.3	203	285	12.0	230	268	7.4	196	259	4.3	212	276	6.8	217	276	6.8	212	276	6.8	212	276	6.8	212	276	6.8	212	276	6.8
8,000.....	224	270	9.9	295	273	10.4	235	271	11.6	227	283	12.3	203	285	12.0	230	268	7.4	196	259	4.3	212	276	6.8	217	276	6.8	212	276	6.8	212	276	6.8	212	276	6.8	212	276	6.8

Altitude (meters) m.s.l.	Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,475 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (767 m.)			Jacksonville, Fla. (16 m.)			Joliet, Ill. (178 m.)			Las Vegas, Nev. (575 m.)			Little Rock, Ark. (88 m.)			Medford, Oreg. (416 m.)			Miami, Fla. (12 m.)			Mobile, Ala. (66 m.)			Nashville, Tenn. (194 m.)			New York, N. Y. (15 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity			
Surface.....	360	238	1.7	362	284	1.9	330	247	1.1	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
500.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
1,000.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
1,500.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
2,000.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
2,500.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
3,000.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
4,000.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
5,000.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
6,000.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8
8,000.....	360	238	1.7	362	284	1.9	330	243	1.7	331	271	2.1	339	88	1.0	341	248	1.8	365	174	0.9	349	196	0.6	353	308	1.5	358	173	2.4	325	232	0.1	347	266	1.4	341	255	1.8

Altitude (meters) m.s.l.	Oakland Calif. (8 m.)			Oklahoma City, Okla. (396 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (338 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			St. Cloud, Minn. ¹ (318 m.)			San Antonio, Tex. (240 m.)			San Diego, Calif. (13 m.)			Sault Ste. Marie, Mich. (225 m.)			Seattle, Wash. (116 m.)			Spokane, Wash. ² (725 m.)			Washington, D. C. (24 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity			
Surface.....	361	267	4.0	342	188	2.3	347	237	0.8	365	244	0.7	348	340	2.4	347	248	1.3	331	260	1.6	352	130	1.6	363	267	3.3	306	284	2.2	335	246	1.8	348	224	1.5	343	243	1.7
500.....	359	289	3.1	342	189	2.3	347	237	0.8	365	245	1.3	348	340	2.4	347	248	1.3	331	260	1.6	352	130	1.6	363	267	3.3	306	284	2.2	335	246	1.8	348	224	1.5	343	243	1.7
1,000.....	342	309	2.1	336	205	2.1	337	219	2.8	365	238	1.7	348	316	3.2	339	243	2.7	352	130	1.6	352	130	1.6	363	267	3.3	306	284	2.2	335	246	1.8	348	224	1.5	343	243	1.7
1,500.....	329	300	2.1	317	205	2.1	337	219	2.8	365	238	1.7	348	316	3.2	339	243	2.7	352	130	1.6	352	130	1.6	363	267	3.3	306	284	2.2	335	246	1.8	348	224	1.5	343	243	1.7
2,000.....	315	301	2.0	296	246	5.3	275	261	5.0	361	238	2.1	326	296	4.7	277	273	6.9	251	270	6.7	313	212	2.2	304	321	1.9	287	278	2.2	335	246	1.8	348	224	1.5	343	243	1.7
2,500.....	306	291	2.0	276	256	6.7	256	269	8.7	354	247	2.2	304	289	6.4	262	261	8.2	218	276	8.2	295	233	3.2	296	310	2.3	287	278	2.2	335	246	1.8	348	224	1.5	343	243	1.7
3,000.....	301	291	3.0	270	265	7.3	234	273	10.3	349	258	2.8	286	288	8.2	243	283	9.6	218	276	8.2	282	250	4.1	288	296	2.8	281	278	2.2	335	246	1.8	348	224	1.5	343	243	1.7
4,000.....	289	298	5.2	237	276	9.3	213	278	12.8	339	260	3.9	230	286	10.9	208	288	11.3	218	276	8.2	282	250	4.1	288	296	2.8	281	278	2.2	335	246	1.8	348	224	1.5	343	243	1.7
5,000.....	248	290	5.4	207	282	11.2	213	278	12.8	339	260	3.9	230	286	10.9	208	288	11.3	218	276	8.2	282	250	4.1	288	296	2.8	281	278	2.2	335	246	1.8	348	224	1.5	343	243	1.7

RIVER STAGES AND FLOODS FOR DECEMBER 1947

ELMER R. NELSON

Precipitation during December was above normal in the South-Central States from New Mexico, Texas, and Louisiana northward to Iowa and Illinois. It was also above normal along the coastal sections of the South Atlantic States and the central portions of the Plateau States. Precipitation was $1\frac{1}{2}$ to 3 times the normal seasonal amounts in Kansas, Oklahoma, New Mexico, and northern Texas. It was also comparatively heavy along the coast of South Carolina and Georgia. In most of the other sections the precipitation averaged around one-half of normal.

The greatest snowfall on record for a single storm occurred in New York City on December 26th, when 25.8 inches fell during a period of 18 hours and 35 minutes. It was 4.9 inches above the record set in the 3-day blizzard in 1888. By the end of December the snow cover along the Atlantic Coast had been reduced to a trace below northern Maryland and central West Virginia, while in New England, eastern New York, the extreme eastern portion of Pennsylvania, and northern New Jersey the snow depths ranged from 6 inches to more than 2 feet. All traces of snow had by then disappeared from Kansas, Nebraska, western South Dakota, Missouri, most of Illinois, and much of Iowa. In the North-Central States only Minnesota, Wisconsin, Michigan, and much of North Dakota were covered with 3 inches or more of snow. Extreme depths exceeding 20 inches were reported from a few stations in the extreme northern portions of these States. During the last week in December the much-above-freezing afternoon temperatures melted most of the snow in the central and western areas. The only snow cover left toward the end of the month in the Pacific and Mountain States was at the highest elevations in the mountain ranges.

Temperatures during the month averaged above normal over the United States except in the New England States, New York, New Jersey, northeastern Pennsylvania, Minnesota, and most of the southern Rocky Mountain and Plateau regions.

The drought that began in Maine, in August, continued unabated through December. Stream flow was well below normal throughout the State during the month. Run-off was excessive in the coastal regions of the Southeastern States, with moderate flooding. Stream flow continued well above normal in the Gulf of Mexico region, but no damaging floods were reported. In Arkansas and northeastern Texas severe flooding was reported on many streams during the month. In the northern and central Rocky Mountain regions, run-off continued above normal; while in the southern California-western Texas region, run-off was deficient.

Atlantic Slope drainage.—The frequent heavy rains during November kept a few of the streams along the Atlantic Coast from North Carolina to Georgia above

flood stage during the last half of November and the first few days of December. Frequent moderate to heavy rains during December caused moderate rises to above-flood stage in the Edisto, Ogeechee, Ocmulgee, Oconee, and Altamaha Rivers in North Carolina, South Carolina, and Georgia during the latter half of the month. In these areas, lowlands were inundated, and the usual operations along the rivers were interrupted although the resulting damage was negligible. The inundation of the lowlands in Georgia caused postponement of such field activities as plowing and planting. Drought conditions continued again in Maine for the fifth consecutive month and extended southward during the month through all of the North and Middle Atlantic States except eastern Massachusetts and Rhode Island.

East Gulf of Mexico drainage.—Scattered heavy rains along the Gulf Coastal States during the period of December 8–16, caused light to heavy overflows on the Flint, Apalachicola, Choctawhatchee, Tombigbee, Pascagoula and Pearl Rivers between the 13th and the end of the month. Most of the precipitation during this period occurred in connection with the storm on the 9th–10th. Some of the 24-hour rainfall amounts reported were: 6.44 inches at Hattiesburg, Miss., 6.42 inches at Franklinton, La. The most serious flood reported in this area occurred on the Pearl River at Pearl River, La., where a stage of 15.4 feet was reported on the 15th. This was 3.4 feet above flood stage or 4.3 feet below the record stage reported in April 1900.

Mississippi System.—In the Arkansas Basin minor flooding occurred on the Poteau River in the vicinity of Poteau, on the 8th. This slight flooding was due to an average rainfall of 1.75 inches over the basin on the 6th–7th. To the south of the basin heavier rains of nearly 3 inches were reported. No damage resulted, as no overflow of importance takes place at this point below a river stage of 27 feet. In the Red Basin, light to heavy flooding occurred on the Sulphur River at Hagansport, Tex., and Naples, Tex., between the 7th and 27th. This flooding was due to heavy rains averaging about 6 inches over the basin on the 3rd and 4th, 6th and 7th, and 14th and 15th. The rainfall over the Cypress and Little Rivers was much less and only minor flooding occurred.

West Gulf of Mexico drainage.—Severe flooding occurred over the upper watershed of the Sabine River between the 8th and the end of the month as a result of the heavy rain that occurred over the upper basin on the 8th. This severe storm was followed by a 2-week rainy period that kept the river above flood stage for a similar period. The total damages were estimated near \$300,000. Rainfall over the upper Calcasieu River Basin was scattered and much lighter than over the Sabine River. Only slight flooding occurred at Kinder, La., on the 18th. No damages were reported. Two flash floods occurred in the upper Trinity River during the month, but the resulting overflows were light and no damage of consequence was reported.

FLOOD STAGE REPORT FOR DECEMBER 1947

[All dates in December unless otherwise specified]

River and station	Flood stage	Above flood stages— dates		Crest ¹	
		From—	To—	Stage	Date
ATLANTIC SLOPE DRAINAGE					
Roanoke: Williamston, N. C.-----	Feet 10	Nov. 8	Nov. 30	11.3	Nov. 20-21
Neuse:					
Goldsboro, N. C.-----	14	Nov. 13	Nov. 30	18.0	Nov. 21
Kinston, N. C.-----	14	Nov. 15	2	16.7	Nov. 27
Edisto:					
Orangeburg, S. C.-----	8	{ 11	19	8.4	16
		{ 21	30	8.9	24
Givhans Ferry, S. C.-----	10	{ Nov. 13	2	11.7	Nov. 25
		{ 13	(²)	13.4	24
Ogeechee:					
Midville, Ga.-----	6	16	19	6.1	17
Dover, Ga.-----	7	{ Nov. 13	5	8.0	Nov. 24
		{ 13	(²)	9.1	21-22
Ocmulgee: Abbeville, Ga.-----	11	{ 16	26	12.2	30
		{ 28	31	11.3	29
Oconee: Milledgeville, Ga.-----	20	22	22	22.1	22
Altamaha:					
Charlotte, Ga.-----	12	{ Nov. 14	6	17.2	Nov. 27
		{ 11	(²)	17.2	23, 24
Piney Bluff, Ga.-----	17	{ Nov. 23	2	19.0	Nov. 26
		{ 14	(²)	18.4	23, 24, 25
EAST GULF OF MEXICO DRAINAGE					
Flint: Albany, Ga.-----	20	18	18	20.0	18
Apalachicola: Blountstown, Fla.-----	15	{ Nov. 15	2	17.2	Nov. 23
		{ 12	(²)	20.5	20
Choctawhatchee: Caryville, Fla.-----	12	15	20	12.8	17
Tombigbee: Lock No. 3, Ala.-----	33	17	21	37.9	19
Leaf: Hattiesburg, Miss.-----	18	10	10	18.4	10
Pascagoula: Merrill, Miss.-----	22	11	15	23.3	13
Pearl: Pearl River, La.-----	12	13	26	15.4	15
MISSISSIPPI SYSTEM					
Upper Mississippi Basin					
Mississippi: Louisiana, Mo.-----	12	{ 4	10	12.5	5
		{ 16	17	12.0	16

FLOOD STAGE REPORT FOR DECEMBER 1947—Con.

River and station	Flood stage	Above flood stages— dates		Crest	
		From—	To—	Stage	Date
MISSISSIPPI SYSTEM—continued					
Arkansas Basin					
Poteau: Poteau, Okla.	Feet 21	8	9	Feet 24.8	8
Red Basin					
Little: Whitecliffs, Ark.	25	11	12	25.7	11
Sulphur:					
Hagansport, Tex.	38 {	7	9	39.5	8
		16	19	39.7	17
Naples, Tex.	22	12	27	27.8	20
Cypress: Jefferson, Tex.	18	22	24	18.6	23
Atchafalaya Basin					
Atchafalaya: Morgan City, La.	6	15	15	6.1	15
WEST GULF OF MEXICO DRAINAGE					
Calcasieu: Kinder, La.	16	18	18	16.1	18
Sabine:					
Mineola, Tex.	14	8	23	17.4	20
Gladewater, Tex.	26	13	(²)	32.8	24
Elm Fork: Carrollton, Tex.	6	16	16	6.4	16
East Fork: Rockwall, Tex.	10 {	7	11	12.9	10
		15	19	14.8	17
Trinity:					
Dallas, Tex.	28 {	8	9	32.1	8
		16	17	33.5	16
Rosser, Tex.	26 {	8	11	28.4	9
		15	22	28.8	19
Trinidad, Tex.	28 {	10	14	30.8	13
		18	24	31.4	21
PACIFIC SLOPE DRAINAGE					
Snohomish: Snohomish, Wash.	20	18	19	20.3	18

¹ Provisional.² Continued at end of month.

CLIMATOLOGICAL DATA FOR DECEMBER 1947

CONDENSED CLIMATOLOGICAL SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS

[For description of tables and charts, see REVIEW, January 1943, p. 15]

In the following table are given for the various sections of the climatological service of the Weather Bureau the monthly average temperature and total rainfall; the stations reporting the highest and lowest temperatures, with dates of occurrence; the stations reporting the greatest and least total precipitation; and other data as indicated by the several headings.

The mean temperature for each section, the highest and

lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperatures and precipitation are based only on records from stations that have 10 or more years of observations. Of course, the number of such records is smaller than the total number of stations.

Section	Temperature						Precipitation					
	Section average	Departure from the normal	Monthly extremes				Section average	Departure from the normal	Greatest monthly		Least monthly	
			Station	Highest	Date	Station	Lowest	Date	Station	Amount	Station	Amount
Alabama.....	49.1	+1.4	2 stations.....	80	5	Valley Head.....	14	17	4.77	-0.51	Tibbie.....	12.07
Arizona.....	40.1	-2.7	Ehrenberg.....	86	27	Fort Valley.....	-20	11	1.26	-0.02	Crown King.....	4.41
Arkansas.....	44.2	+1.4	Okay.....	78	28	Gilbert.....	10	25	4.22	-0.01	Mt. Ida.....	8.82
California.....	43.9	-1.9	Blythe.....	99	26	Elery Lake.....	-14	18	1.50	-2.38	Upper Mattole.....	6.80
Colorado.....	25.5	-4	2 stations.....	73	27	Sunbeam.....	-31	31	.89	+0.01	Wolf Creek Pass.....	5.32
Florida.....	62.0	+2.1	do.....	88	16	Niceville.....	28	1	2.80	+0.03	Lake City.....	6.93
Georgia.....	48.0	+3	Waycross.....	83	7	La Fayette.....	13	14	5.30	+1.01	Tifton.....	8.66
Idaho.....	28.3	+1.7	Oakley.....	61	27	Gray Lake.....	-22	31	1.46	-0.60	Orofino.....	6.40
Illinois.....	33.8	+2.7	3 stations.....	67	29	Galva.....	5	19	2.13	+0.03	Carbondale.....	5.31
Indiana.....	32.6	+4	2 stations.....	65	14	Salamonia.....	0	24	1.66	-1.05	Kentlano.....	2.71
Iowa.....	26.8	+2.2	Creston.....	65	2	2 stations.....	-13	9	1.46	+0.36	Keokuk.....	2.67
Kansas.....	34.3	+1.2	Wichita.....	74	2	Burr Oak.....	-6	11	2.08	+1.17	Ottawa.....	4.70
Kentucky.....	37.8	+1	Pikesville.....	73	5	Headquarters.....	8	25	1.77	-1.09	Lovelaceville.....	3.14
Louisiana.....	32.6	+1	New Roads.....	82	7	Plain Dealing.....	20	26	6.64	+1.30	Morgan City.....	12.07
Maryland-Delaware.....	34.3	-1.0	Cheltenham, Md.....	66	3	Oakland, Md.....	1	11	1.64	-1.50	La Plata, Md.....	3.95
Michigan.....	25.5	-1	2 stations.....	57	8	Cadillac.....	-17	19	1.71	-0.33	Houghton.....	4.02
Minnesota.....	14.1	-1.7	Grand Marais.....	45	15	Warroad.....	-33	31	.55	-0.20	Pigeon River Bridge.....	2.08
Mississippi.....	48.6	+3	2 stations.....	80	17	2 stations.....	19	11	4.56	-0.72	Hattiesburg.....	11.89
Missouri.....	37.7	+3.5	do.....	73	18	Black (near).....	7	16	1.84	-0.33	Alton (near).....	6.12
Montana.....	26.1	+2.6	do.....	64	26	2 stations.....	-23	31	.67	-0.28	Heron.....	3.04
Nebraska.....	28.6	+1.5	3 stations.....	66	127	Scottsbluff.....	-13	31	.87	+0.19	Falls City.....	2.45
Nevada.....	31.7	+2	Overton.....	71	127	Ely.....	-14	31	.79	-0.19	Pioche.....	4.68
New England.....	23.2	-3.1	Greenville, R. I.....	64	3	Wilder, Vt.....	-20	25	2.52	-0.81	Blue Hill, Mass.....	5.30
New Jersey.....	32.0	-1.6	Chatsworth.....	65	3	Layton.....	-4	25	2.85	-0.68	Long Branch.....	5.29
New Mexico.....	32.5	-1.7	Artesia.....	74	28	2 stations.....	-24	11	.91	+0.20	Holy Ghost Canyon.....	2.67
New York.....	24.2	-2.4	Elmira.....	64	3	Wanakena.....	-23	20	2.39	-0.54	Bedford Hills.....	5.64
North Carolina.....	41.7	-8	2 stations.....	77	14	Hot Springs.....	0	1	2.19	-1.00	Wilmington.....	5.50
North Dakota.....	14.2	+8	do.....	54	26	Willow City.....	-36	31	.42	-0.05	Grafton.....	1.63
Ohio.....	31.6	0	do.....	64	13	4 stations.....	0	124	1.61	-1.07	Geneva.....	2.66
Oklahoma.....	41.5	+1.4	Stillwater.....	78	28	Kenton.....	1	110	2.43	+0.71	Valliant.....	10.30
Oregon.....	34.8	+1.1	Lake Creek.....	77	27	Danner.....	-20	11	2.55	-1.29	Tidewater.....	13.91
Pennsylvania.....	29.6	-1.6	Phoenixville.....	66	2	2 stations.....	-5	30	1.51	-1.54	Kregar.....	3.51
South Carolina.....	46.0	-6	2 stations.....	79	18	Walhalla.....	15	11	4.56	+0.95	Ridgeland.....	8.89
South Dakota.....	23.3	+1.2	Vale.....	68	25	Sisseton.....	-18	9	.17	-0.34	Wagner.....	1.07
Tennessee.....	41.1	+4	Kenton.....	75	9	Rugby.....	10	1	2.55	-1.05	Monteagle.....	3.84
Texas.....	50.0	+1.1	2 stations.....	89	17	Stratford.....	8	14	2.76	+0.44	Gilmer.....	9.05
Utah.....	26.8	-5	Kanab.....	62	26	Woodruff.....	-20	31	1.44	+0.31	Alta.....	4.93
Virginia.....	36.9	-1.1	Columbia.....	71	3	Mountain Lake.....	6	1	1.25	-1.78	Wallaceton (near).....	2.77
Washington.....	35.3	+2.0	Port Townsend.....	67	12	Quincy (near).....	1	11	4.90	-0.69	Spruce.....	26.17
West Virginia.....	33.9	-7	Williamson.....	73	5	Mannington.....	-4	29	1.36	-1.87	Brandonville.....	2.82
Wisconsin.....	21.1	+5	Kenosha.....	55	7	Hatfield.....	-34	9	1.00	-0.29	Platteville.....	1.90
Wyoming.....	24.4	+2.1	4 stations.....	65	27	Bondurant.....	-29	31	.51	-0.20	Snake River.....	2.82
Alaska (Nov.).....	18.8	+4.6	2 stations.....	59	11	Allakaket.....	-34	16	3.22	+0.48	Whittier.....	36.85
Hawaii (Nov.).....	72.3	+7	Waianae.....	92	1	Haleakala Ranger Station.....	39	16	7.17	-0.49	Walawa.....	29.88
Puerto Rico.....	74.5	+3	Ponce.....	96	13	Cayey.....	51	29	3.59	+0.20	Rio Piedras.....	10.76
											Coamo Dam.....	.06

¹ Other dates also.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS FOR DECEMBER 1947

[illegible]

See footnotes at end of table.

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS FOR DECEMBER 1947—Continued

District and station	Elevation of instruments			Pressure		Temperature of the air										Precipitation		Wind																
	Barometer above sea level	Thermometer above ground	Anemometer above ground	Station	Sea level	Departure from normal	Temperature from normal					Total degree days	Mean temperature of the dew point	Mean relative humidity	Total			Departure from normal	Greatest in 24 hours	Days with 0.01 inch or more	Average hourly velocity	Prevailing direction	Maximum velocity											
							Mean	Departure from normal	Maximum	Date	Mean maximum					Minimum	Date						Mean minimum	Greatest daily range	Miles per hour	Direction								
OHIO VALLEY AND TENNESSEE—Con.																																		
Evansville ²	431	6	40	1,004.4	1,020.3	-1.7	36.8	+2.0	62	7	47	15	1	27	35	873	30	2.50	-1.0	1.81	5	7.7	s.	28	s.	7	10	9	12	5.7	0	1		
Indianapolis ²	823	5	54	988.2	1,019.3	+3.3	31.6	+4.7	58	7	40	19	16	24	30	1,033	25	1.61	-1.3	2.73	9	10.2	sw.	35	w.	8	6	15	6.7	4.7	0	0		
Terre Haute ²	575	4	36	998.6	1,020.3	+0.0	32.9	+4.0	61	3	45	19	25	30	31	995	27	1.40	-1.6	2.76	7	9.8	se.	14	sw.	16	8	9	14	6.1	1.4	0		
Cincinnati ²	627	135	148	997.0	1,020.7	+0.0	37.4	+4.0	61	3	45	19	25	30	31	983	24	1.44	-1.6	2.76	8	9.6	se.	27	sw.	8	6	17	6.6	6.2	0	0		
Columbus ²	822	90	110	982.5	1,020.0	+0.0	33.4	+1.0	58	3	40	10	25	30	30	983	24	1.44	-1.6	2.76	7	11.5	sw.	32	w.	8	6	19	6.9	5.4	0	0		
Dayton ²	1,003	6	55	982.4	1,020.0	+0.0	31.0	+3.0	57	3	39	9	25	35	35	1,058	25	1.45	-1.6	2.76	12	6.8	w.	34	w.	8	7	42	6.9	4.1	0	0		
Elkins ²	1,947	5	45	948.9	1,021.0	+0.0	32.0	+3.0	60	5	44	7	29	20	43	1,024	24	1.55	-1.9	2.70	10	6.1	sw.	25	nw.	5	8	6	17	6.3	2.8	0	0	
Parkersburg ²	637	77	84	996.6	1,020.3	+0.0	35.5	+3.0	61	3	44	14	25	27	34	913	26	1.82	-1.2	2.76	10	6.1	sw.	25	nw.	5	8	6	17	6.3	2.8	0	0	
Pittsburgh ²	842	39	54	988.2	1,019.0	+0.0	32.6	+3.0	58	3	40	15	29	25	32	1,005	24	1.19	-1.7	2.55	10	10.8	s.	35	sw.	5	5	4	22	7.4	2.6	0	0	
LOWER LAKES																																		
Buffalo ²	768	34	96	988.8	1,018.0	+4.4	27.9	-1.5	42	8	35	10	20	22	26	1,135	21	1.78	-0.7	2.64	14	14.4	w.	50	sw.	17	3	6	22	7.9	4.3	0	0	
Canton ²	448	10	61	1,000.7	1,017.6	+3.3	18.2	-3.6	45	8	26	-16	30	10	31	1,447	14	2.28	-0.4	2.57	13	8.6	w.	34	w.	16	6	15	6.7	15.7	5.2	0	0	
Oswego ²	335	71	85	1,005.1	1,018.0	+0.0	26.8	-1.3	49	3	33	3	20	21	22	1,184	18	2.60	-0.9	2.62	19	11.1	se.	31	w.	9	3	5	23	8.1	20.6	2.9	0	0
Rochester ²	823	4	69	998.3	1,018.0	+0.0	26.7	-1.1	50	3	34	3	20	20	29	1,186	21	2.02	-0.7	2.63	15	11.6	w.	45	sw.	8	3	2	26	8.4	15.3	2.4	0	0
Syracuse ²	596	5	57	995.3	1,018.3	+3.3	25.8	-1.6	53	3	34	-3	20	18	31	1,213	19	2.32	-0.8	2.64	22	10.3	sw.	40	w.	9	3	4	24	8.1	12.1	4.5	0	0
Erie ²	714	57	81	991.9	1,018.6	+3.3	32.2	+3.6	56	8	38	14	20	27	27	1,018	25	2.32	-0.8	2.79	16	9.1	w.	27	sw.	18	4	2	25	8.3	6.8	0	0	0
Cleveland ²	762	27	54	990.5	1,019.3	+3.3	31.5	+2.4	56	8	38	14	21	25	29	1,040	25	1.84	-0.6	2.54	10	11.6	w.	38	w.	8	4	3	24	7.9	3.4	0	0	0
Sandusky ²	629	5	67	995.6	1,019.6	+6.6	31.8	+6.6	56	8	38	16	29	26	27	1,031	22	2.08	-0.2	2.96	11	9.8	w.	29	sw.	8	4	3	24	8.2	4.0	0	0	0
Toledo ²	628	5	47	995.3	1,019.3	+0.0	28.2	-0.9	55	8	36	2	20	21	32	1,142	22	1.87	-0.5	2.65	11	10.9	sw.	34	w.	8	2	8	21	8.0	10.0	1.6	0	0
Fort Wayne ²	857	5	34	987.1	1,019.3	+0.0	29.9	+3.3	55	7	36	7	20	22	26	1,121	24	1.63	-1.0	2.48	10	9.2	s.	29	s.	17	2	7	22	8.2	6.6	2.2	0	0
Detroit ²	730	5	77	991.5	1,019.0	+4.4	29.0	+1.1	52	8	34	8	20	24	27	1,117	24	1.85	-0.6	2.49	11	10.7	nw.	36	nw.	8	2	6	23	8.2	9.4	1.8	0	0
UPPER LAKES																																		
Alpena ²	609	5	89	993.9	1,017.3	+4.4	26.3	+1.2	42	8	31	7	18	21	21	1,199	22	1.40	-0.5	2.56	16	10.9	nw.	33	nw.	16	1	5	25	8.7	13.5	2.0	0	0
Escanaba ²	612	51	72	994.2	1,018.0	+7.7	23.8	+1.4	39	2	30	1	18	18	23	1,277	20	1.60	-1.2	2.36	7	10.2	nw.	34	n.	8	4	8	19	7.4	5.8	2.2	0	0
Grand Rapids ²	707	70	244	991.5	1,018.3	+0.0	30.2	+1.7	54	7	35	13	19	26	21	1,081	23	1.47	-1.1	2.04	10	11.4	s.	43	sw.	7	1	4	26	8.6	9.8	0	0	0
Lansing ²	878	5	90	985.4	1,018.6	+6.6	27.3	+1.4	53	8	33	9	19	22	31	1,169	22	1.82	-0.7	2.54	12	8.7	sw.	28	w.	8	1	6	24	8.5	15.3	2.7	0	0
Marquette ²	734	44	73	989.2	1,017.3	+0.0	23.0	+1.3	37	2	28	3	17	18	16	1,302	18	1.62	-1.0	2.63	10	8.2	w.	26	s.	13	1	5	25	8.6	17.8	7.2	0	0
Sault Sainte Marie ²	614	10	52	993.2	1,016.9	+0.0	20.3	+1.5	37	3	26	-8	18	14	24	1,388	18	1.60	-0.6	2.33	21	11.0	e.	39	nw.	27	2	5	24	8.2	27.4	11.9	0	0
Chicago ²	673	5	38	993.2	1,019.0	+0.0	30.0	+3.1	54	7	37	13	9	23	22	1,086	24	1.63	-0.4	2.69	7	10.1	s.	34	w.	7	5	8	18	7.5	6.1	0	0	0
Green Bay ²	617	5	32	994.9	1,018.6	+3.3	22.6	+3.0	40	2	29	2	13	16	26	1,318	17	1.29	-0.4	2.54	10	7.7	s.	26	w.	8	5	4	22	7.4	7.8	1.5	0	0
Milwaukee ²	681	33	66	992.6	1,018.6	+3.3	26.9	+2.2	48	7	34	9	16	20	24	1,181	22	1.72	-0.7	2.70	7	12.4	nw.	36	e.	4	4	4	23	7.7	5.2	1.1	0	0
Duluth ²	1,133	5	47	974.9	1,018.3	+3.3	15.6	-3.3	34	22	22	-5	17	9	23	1,530	12	1.49	-0.7	2.13	10	11.0	nw.	38	nw.	8	6	7	18	7.1	4.8	5.1	1	0
NORTH DAKOTA																																		
Fargo ²	940	5	47	983.4	1,020.0	+4.4	12.6	+1.8	34	14	20	-20	31	0	36	1,706	8	1.90	-2.2	2.30	7	11.0	n.	35	s.	10	6	6	19	7.1	5.5	15.3	0	0
Bismarck ²	1,677	5	41	956.0	1,019.6	+4.4	14.3	+1.5	43	26	24	-20	31	4	41	1,571	12	1.90	-0.3	2.23	3	8.4	nw.	45	n.	14	4	5	22	7.5	3.0	4.6	0	0
Devils Lake ²	1,478	11	44	962.8	1,019.6	+6.6	9.4	-1.1	36	26	18	-22	31	1	30	1,726	6	1.82	-0.1	2.22	8	7.8	w.	26	n.	14	5	5	21	7.3	6.0	7.3	0	0
Grand Forks ²	832	4	41	987.8	1,020.3	+1.3	8.0	-1.3	33	26	18	-25	31	-2	34	1,768	6	1.90	-0.4	2.15	10	7.8	n.	26	n.	14	5	5	18	6.6	9.4	0	0	0
Williston ²	1,878	42	50	947.9	1,017.3	-1.7	21.2	+7.4	49	26	30	-10	8	12	40	1,358	18	1.88	-0.3	2.11	5	8.9	se.	34	n.	14	7	7	17	6.7	2.8	1.6	0	0
UPPER MISSISSIPPI																																		
Minneapolis - St. Paul ²	919	43	74	983.7	1,019.3	+1.0	28.8	+2.3	37	21	26	-12	9	0	30	1,466	14	2.04	+0.3	2.45	11	9.1	nw.	26	ne.	4	5	6	20	7.4	6.7	5.4	0	0
La Crosse ²	714	5	29	991.5	1,018.6	+4.4	18.1	-2.3	36	2	28	-19	9	8	38	1,451	16	1.82	-0.7	2.71	7	7.6	nw	27	nw.	25	3	8	20	7.5	10.5	2.5	0	0
Madison ²	974	27	39	982.1	1,019.0	+0.0	24.2	+1.8	42	2	32	2	9	17	26	1,270	20	1.37	-0.3	2.84	9	9.6	w.	34	nw.	7	4	7	20	7.5	7.7	2.0	0	0
Charles City ²	1,015	10	51	981.4	1,020.0	+4.4	22.2	+1.8	40	2	30	-5	9	15	27	1,328	20	1.																

CLIMATOLOGICAL DATA FOR WEATHER BUREAU STATIONS FOR DECEMBER 1947—Continued

District and station	Elevation of instruments			Pressure		Temperature of the air										Precipitation			Wind																
	Barometer above sea level ¹	Thermometer above ground	Anemometer above ground	Station	Sea level	Departure from normal	Temperature of the air					Total degree days	Mean temperature of the dew point	Mean relative humidity	Total	Departure from normal	Greatest in 24 hours	Days with 0.01 inch or more	Average hourly velocity	Prevailing direction	Maximum velocity		Miles per hour	Direction	Date	Clear days	Partly cloudy days	Cloudy days	Average cloudiness, tenths	Total snowfall	Snow, sleet, and ice on ground at end of month	Number of days with thunderstorms			
							Mean	Maximum	Date	Mean minimum	Minimum										Date	Mean minimum											Greatest daily range	Direction	Direction
MIDDLE SLOPE																																			
Denver ¹	5,292	106	113	836.8	1,018.0	-6	36.3	+2.2	71	27	46	7	31	26	39	900	16	58	1.59	+	6	10	3	7.2	s.	26	n.	24	12	10	9	5.3	6.7	5.5	0
Pueblo ¹	4,690	5	36	856.4	1,019.3	+	33.4	+3.7	68	27	49	4	31	18	54	981	29	66	1.16	+	6	10	3	7.2	s.	26	n.	24	12	10	9	5.3	6.7	5.5	0
Concordia	1,392	50	58	967.5	1,019.3	-1.0	32.4	+1.7	64	2	40	5	11	24	32	1,010	26	82	2.47	+	1.8	1.88	5	7.3	n.	26	n.	21	11	13	7	5.1	5.3	5.7	0
Dodge City ¹	2,509	5	58	928.2	1,019.0	-1.7	32.2	-4	64	2	42	7	10	23	32	1,018	27	86	1.61	+	1.0	1.90	5	13.2	n.	34	n.	31	12	6	13	5.3	4.7	4.4	0
Wichita ¹	1,358	52	64	968.5	1,018.6	-1.0	36.4	+1.8	62	28	45	14	12	28	29	889	30	80	2.98	+	2.0	2.20	7	13.2	s.	32	w.	31	9	7	15	6.0	3.5	3.5	1.0
Oklahoma City ¹	1,214	10	47	974.6	1,019.0	-1.0	42.1	+2.8	72	28	52	17	31	33	33	710	34	79	2.35	+	1.8	1.39	4	8.9	s.	22	n.	3	12	9	10	5.0	3.5	3.5	1.0
Tulsa ¹	674	10	60	993.9	1,018.6	-1.0	41.6	+2.8	72	28	53	20	25	30	44	725	32	74	1.03	+	1.9	1.81	5	10.5	s.	34	se.	3	12	9	10	5.2	T	0	1
SOUTHERN SLOPE																																			
Abilene ¹	1,738	4	59	956.0	1,018.3	-1.7	44.4	+1.0	73	27	58	24	31	37	36	546	37	74	1.32	+	1.4	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Amarillo ¹	3,676	5	42	889.3	1,018.1	-1.2	38.1	+2.6	71	27	51	15	31	26	42	835	26	74	1.26	+	1.5	1.78	4	12.8	s.	32	sw.	21	11	8	12	5.1	3.1	3.0	0
Del Rio	960	63	71	983.7	1,018.0	-1.3	53.7	+1.5	76	4	64	32	26	43	40	353	42	70	1.64	+	1.1	1.38	3	7.8	n.	41	n.	31	10	10	11	5.5	2.8	2.8	0
Roswell	3,614	6	29	892.3	1,018.3	-1.0	38.6	-2.6	68	28	54	7	31	23	46	819	24	64	1.63	+	2	1.59	4	7.0	n.	29	w.	2	18	4	9	4.0	3.6	2.0	1
SOUTHERN PLATEAU																																			
El Paso ¹	3,778	35	85	887.6	1,017.3	-1.3	43.1	-1.2	68	2	55	17	14	31	36	684	24	50	1.79	+	1.1	1.58	3	9.1	n.	35	sw.	31	17	6	8	4.0	3.7	3.7	0
Albuquerque ¹	4,972	5	45	849.0	1,018.6	-1.0	34.6	+1.5	59	2	46	13	13	23	35	942	21	62	1.05	+	1.3	1.58	3	9.1	n.	35	sw.	31	17	6	8	4.0	3.7	3.7	0
Flagstaff	6,907	34	48	789.7	1,021.7	+3.7	28.1	-1.5	55	27	42	-9	11	14	47	1,147	16	65	2.02	+	1.3	1.58	3	9.1	n.	35	sw.	31	17	6	8	4.0	3.7	3.7	0
Phoenix ¹	1,107	39	87	978.0	1,018.0	-1.0	51.0	-1.0	76	27	63	30	11	39	35	432	32	56	1.32	+	1.3	1.58	3	9.1	n.	35	sw.	31	17	6	8	4.0	3.7	3.7	0
Tucson ¹	2,555	5	39	927.5	1,017.3	-1.0	48.2	-2.5	76	1	61	24	11	35	41	518	28	49	1.41	+	1.3	1.58	3	9.1	n.	35	sw.	31	17	6	8	4.0	3.7	3.7	0
Yuma	142	9	54	1,012.5	1,017.6	0	53.6	-1.6	76	27	66	31	9	42	33	352	32	47	1.11	+	1.3	1.58	3	9.1	n.	35	sw.	31	17	6	8	4.0	3.7	3.7	0
MIDDLE PLATEAU																																			
Reno ¹	4,527	20	52	864.5	1,021.7	+4	29.0	-6	58	25	48	7	30	17	45	1,010	22	78	1.78	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Winnemucca	4,339	5	56	870.6	1,022.4	+	32.4	+5	58	25	40	6	31	20	34	1,084	24	78	1.01	+	1.0	1.01	1	5.0	n.	34	w.	28	5	12	14	6.3	1.0	0	0
Modena	5,473	10	46	834.4	1,021.7	+7	24.0	-4.1	51	27	36	-5	31	12	41	1,267	22	78	1.45	+	1.3	1.29	6	7.3	n.	25	sw.	7	2	6	23	7.6	5.5	0	0
Salt Lake City ¹	4,227	32	46	870.0	1,022.4	+4	29.8	-4	50	5	38	8	31	22	27	1,091	26	85	1.79	+	1.3	1.29	6	7.3	n.	25	sw.	7	2	6	23	7.6	5.5	0	0
Grand Junction ¹	4,602	60	68	862.5	1,024.0	+3.3	28.6	+1.1	49	26	38	8	12	19	28	1,129	22	81	1.49	+	1.3	1.29	6	7.3	n.	25	sw.	7	2	6	23	7.6	5.5	0	0
NORTHERN PLATEAU																																			
Baker ¹	3,471	36	54	898.4	1,022.7	+3	31.9	+1.7	44	20	37	11	30	22	23	1,101	24	86	1.04	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Boise ¹	2,739	5	49	924.1	1,023.4	0	31.4	+1.1	48	19	38	9	10	24	23	1,046	28	86	1.48	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Pocatello ¹	4,478	5	31	865.9	1,024.4	+1.7	26.4	+1.1	44	28	34	9	31	19	32	1,194	22	80	1.14	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Spokane ¹	1,929	27	42	949.5	1,020.7	+4	31.2	+7	47	24	36	13	9	27	18	1,051	28	86	1.80	+	1.4	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Walla Walla	991	57	65	984.1	1,021.0	+3	38.8	+3.3	58	23	45	25	12	33	27	812	22	81	1.93	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Yakima ¹	1,076	58	67	980.4	1,020.7	0	34.2	+2.0	53	1	41	18	6	28	29	955	30	86	1.22	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
NORTH PACIFIC COAST																																			
North Head	211	5	56	1,009.8	1,017.6	+1.0	43.8	+2.0	66	25	50	38	19	43	18	571	42	82	8.65	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Seattle ¹	125	90	321	1,013.5	1,018.3	-1.0	45.1	+2.5	58	24	49	34	5	41	16	612	40	86	6.26	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Tacoma	194	172	201	1,010.8	1,018.0	+4	43.6	+3.0	58	23	48	32	5	39	17	660	40	86	6.26	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Tatoosh Island	86	9	61	1,012.9	1,015.9	+7	45.2	+1.3	57	26	49	38	7	42	12	612	42	88	13.93	+	1.2	1.43	7	12.0	s.	42	w.	3	10	8	13	5.0	T	T	4
Medford ¹	1,329	29	58	973.2	1,022.4	+2.4	37.6	-5	59	20	44	25	30	31	28	845	35	88	1.34	+	1.5	1.36	16	5.8	sw.	33	sw.	13	1	2	28	9.2	11.9	0	0
Portland, Oreg. ¹	154	68	106	1,013.9	1,020.0	-1.0	45.0	+3.8	59	23	50	33	26	40	22	622	39	84	4.79	+	1.9	1.88	24	5.2											
Roseburg	510	45	76	1,002.4	1,021.3	+1.7	43.2	+1.4	55	23	49	30	25	37	25	674	39	84	3.38	+	2.0	1.99	15	3.6	s.	18	w.	18	0	4	27	8.6	0	0	
MIDDLE PACIFIC COAST																																			
Eureka	60	72	88	1,019.6	1,022.0	+2.0	47.4	-5	70	26	55	35	30	41	26	519	42	78	1.82	+	2.6	1.75	14	5.7	se.	27	sw.	21	3	11	17	6.6	0	0	0
Red Bluff ¹	455	5	63	1,008.5	1,021.3	+	44.8	-1.3	66	1	53	30	9	36	30	624	36	75	1.69	+	2.7	1.70	14	5.7	n.	21	n.	2	6	8	17	6.8	0	0	0
Sacramento ¹	66	92	115	1,018.6	1,021.0	-1.0	45.8	-4	66	2	54	31	30	38	25	593	38	79	1.65	+	2.4	1.43	6	6.3	n.	26	n.	1	9	6	16	6.4	0	0	0
San Francisco ¹	155	112	132	1,015.2	1,021.0	+1.7	51.0	-3	69	2	56																								

SEVERE LOCAL STORMS FOR DECEMBER 1947

[The table hereunder contains such data as have been received concerning severe local storms that occurred during the month. A revised list will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
Phoenix, Ariz.	2	2:45-3:10 p. m., M. S. T.	50-100	0		Small tornado.	A tornado aloft, after which tube dissipated. Parent cloud obscured by lower layer through which funnel cloud penetrated. Tube portion approximately horizontal most of its length, with lower end slanting more sharply toward ground. Lower clouds were at 9,000 feet. A DE-4 pilot at 1,100 feet reported what appeared to be a tornado in vicinity of Phoenix. Tornado moved northeastward, passing west and north of Phoenix. Hail fell. A heavy rain shower occurred. No especially strong winds on surface, except vicinity of Six Points on West McDowell Road. 1- and 2-inch planks scattered and damaged to extent of about \$50. 2 steel trailers, weighing 2,500 pounds each, lifted into the air, twirled around, and 1 dropped upside down; no appreciable damage. Whirl of wind estimated by eye witnesses to be 50 to 100 feet in diameter; its path on the surface only about 1/4 mile long; filled with dust and blowing paper, but otherwise not especially dark or opaque.
Dodge City, Kans., north-eastward across State.	2-3	Evening 2d-afternoon 3d.			\$3,050,400	Ice and glaze.	Reported as worst storm of this nature in this section. Traffic delayed; power and communication lines broken; cars damaged by falling limbs; trees and shrubs split and broken. Livestock suffered severely and unharvested grain sorghums were damaged.
Nebraska: southeastern portion south of Platte River, and northeastern portion.	3-4	Late afternoon of 3d, continuing into 4th.	140-160		97,000	Freezing rain (glaze).	Over 1,000 poles of telephone and power lines required replacement; over 22,000 wire breaks. Much damage to trees, not included in estimate. Considerable interruption to motor traffic. Ice increased diameter of 1/4-inch wires to 1 to 2 inches.
Iowa: wide belt from southwest to northeast.	3-4					Sleet and snow.	Freezing rain coated communication lines with 1/4 to 1 1/4 inches of ice; heaviest accumulation in southwest, where many telephone lines broke down; damage to lines estimated at more than \$300,000.
Iowa, northwest half.	7					do.	1 to 6 inches new snow, preceded by some rain and glaze, formed an additional coating on telephone and power circuits; lines also whipped by strong winds; numerous breaks occurred.
Simmesport, La.	8	5:45-6 a. m.			8,000	Wind.	Storm moved northeastward; unroofed 7 or 8 homes, destroyed several outhouses, and uprooted considerable timber.
Pensacola, Fla.	15	8:25 a. m.	50	0	40,000	Tornado.	Storm path about 1 mile long; 4 persons injured; 1 dwelling and store demolished; several dwellings suffered major damage.
Wilkes-Barre, Pa.	16	12:43-3 a. m.				Wind.	Electric services disrupted; business district greatly damaged by winds up to 70 m. p. h.; more than a score of show windows shattered.
New York City, N. Y., and vicinity.	26-27	3:20 a. m. 26th-3:05 a. m. 27th.		4		Snow.	Heaviest snowfall of record brought all traffic to near standstill. Thousands of automobiles abandoned in streets and highways; commuters marooned. Only 60 percent of streets cleared by Jan. 2. Cost of snow removal and economic losses must be measured in unestimated millions of dollars.
Vanceville, Cotton Valley, Leton, Dykesville, and Haynesville, La.	31	4:00-4:30 p. m.	20-450	15	1,500,000	Tornado, heavy hail.	First observed crossing Louisiana Highway No. 10, just south of Vanceville, by a traveler who estimated diameter of tornado at 20 yards. Crossing wooded and swampy land, it struck the oil and farming town of Cotton Valley at 4:15 p. m., about 1/4 mile south of business district, damaging 15 to 20 homes; then, swinging abruptly around by passing the town on a westward track and looping, it struck business district again from southwest. Moving eastward, it struck small community of Leton, and from the south, Dykesville. At 4:30 p. m. passed over western and northern edge of Haynesville. At Cotton Valley, 1/4 of the buildings destroyed or severely damaged; 14 persons dead, 250 injured; 100 homes, 30 business places, and an undetermined number of oil derricks destroyed. At Haynesville, 2 persons killed; 20 injured; 25 homes destroyed and 50 damaged. At Leton and Dykesville, 1 person killed at each place. Damages estimated at \$1,000,000 in Cotton Valley and \$450,000 at Haynesville, the remainder being at Leton, Dykesville, and intervening countryside. Mayor of Cotton Valley estimated time of passage over that town on both tracks as about 2 minutes.
Gillham, Ark.	31	4 p. m. C. S. T.	20-200	0	30,000	Tornado.	Struck first at Gillham; moved northeastward over mountainous and sparsely settled sections. Damaged 20 homes in Gillham; injured 3 people.
Three Creeks, and community 2 miles south of El Dorado, Ark.	31	About 5 p. m.	30-100	0	4,000	do.	Possibly same storm that originated near Shreveport, La. Damaged 6 homes; injured several people.
Strong, Ark.	31	About 5 p. m.			1,500	Wind.	Several houses unroofed.
Oxford, Ark.	31	7 p. m. C. S. T.		0	2,000	Tornado.	Possibly same storm that struck Gillham. Damaged 3 homes; no injuries.
Arkansas: Columbia, Union, Jefferson, Lee, and Crittenden Counties.	31	7:45-10:30 p. m.	50-150	2	178,000	do.	Originated just south of Magnolia; moved northeastward. In Columbia and Union Counties, 1 person killed; 10 injured; 12 homes, 1 gymnasium, and 10 oil rigs destroyed. Struck Gethsemene, Jefferson Co., about 9 p. m.; several tenants' homes destroyed; 1 person killed; 10 injured. Hit Marianna and Brikeys sections of Lee Co., about 9:45 p. m.; 30 homes damaged; 75 people injured. Passed over edge of Marion in Crittenden Co., about 10:30 p. m., damaging 3 homes, injuring 1 person. This appears to have been one tornado that continued into Tennessee as windstorm.
Grenada, Miss.	31	Late p. m.				Wind.	Apparently not a tornado. Considerable timber blown down; barns demolished.
Munford, Tenn.	31	10:15 p. m. C. S. T.	3,960		26,000	High winds, heavy rain, light hail, and lightning.	Two small homes demolished. Damage to trees, power and telephone lines, windows, chimneys, roofs. Two persons slightly injured. No indication of a tornado.
Milan, Newbern, and Eads, Tenn.	31	10:45 p. m. C. S. T.	660-1,320	3	77,500	High winds and light hail.	Damage to telephone and power lines, trees, windows, chimneys, a few automobiles, farm equipment, tin roofs; about 22 small houses and outbuildings almost completely demolished; 9 persons injured. No evidence of a tornado.

¹ Miles instead of yards;

775573-48-3

LATE STORM REPORTS FOR AUGUST-NOVEMBER 1947

[The table hereunder contains such data as were received concerning severe local storms that occurred during these months. A revised list will appear in the United States Meteorological Yearbook]

Place	Date	Time	Width of path, yards	Loss of life	Value of property destroyed	Character of storm	Remarks
St. Louis, Mo.-----	August 20	2-3 p. m.-----	-----	-----	\$5,000	Thunderstorm and wind.	Storm from southwest damaged 2 buildings, injured 2 people. Trees and wires blown down; several small fires started by lightning. Lightning struck and burned barn 5 miles south of Shelby.
Shelby County, Mo.-----	20	3 p. m.-----	-----	-----	-----	Electrical.-----	
Mercer and Putnam Counties, Mo.	September 11	Early morning.	¹ 7-10	0	-----	Tornado-----	Storm from northwest struck eastern part of Mercer and western part of Putnam Counties, resulting in considerable property and crop damage. Numerous homes, barns, outbuildings, trees, wires, and few windmills damaged or blown down; most haystacks in storm path blown down or tops blown off. Considerable damage to corn and soybeans by hail.
Callaway County, Mo.-----	11	11:10-11:25 a. m.	¹ 1	0	10,000	-----do-----	
Iowa: central and northern portions.	November 14-15	-----	-----	-----	-----	Heavy snow-----	Storm from southwest struck few miles south and east of Fulton, damaging homes, barns, outbuildings, trees, wires, and killing poultry. Moderate hail damaged corn and gardens; stones 1 to 1½ inches in diameter. Crop damage estimated at \$1,000. Driving rain caused much damage.
							Heavy, wet snow, with amounts up to 10 inches, covered most of State night of 14th. Weight of snow or fallen tree limbs caused scattered wire breaks in telephone and telegraph lines. Storm damage to telephone lines alone estimated from \$50,000 to \$75,000.

¹ Miles instead of yards.

SOLAR RADIATION AND SUNSPOT DATA FOR DECEMBER 1947

[Solar Radiation Investigation Section, I. F. HAND in Charge]

Explanations of the tables and references to descriptions of instruments, stations, methods of observation, and summaries of data are given in the Monthly Weather Review, vol. 72, page 43, January 1944. A list of pyrheliometric stations is given on page 45 of the same Review. An explanation of the formula used in computing the air mass values for each station will be found in vol. 75, page 47, March 1947.

SOLAR RADIATION OBSERVATIONS

TABLE 1.—Solar radiation intensities during December 1947

[Gram calories per minute per square centimeter of normal surface]

Date	Sun's zenith distance								Vapor pressure		
	A. M.				0.0°	P. M.					
	78.7°	75.7°	70.7°	60.0°		60.0°	70.7°	75.7°			78.7°
	78.7°	75.7°	70.7°	60.0°		60.0°	70.7°	75.7°	78.7°		

CLIMAX, COLO.

December	Air mass									mb.	mb.
	3.24	2.59	1.94	1.29	*0.65	1.29	1.94	2.59	3.24		
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.		
5			1.47	1.60		1.60	1.46	1.36	1.29		
6			1.36								
7			1.48								
8							1.48				
9			1.49	1.54		1.55	1.42	1.36	1.28		
10			1.47								
12			1.52						1.24		
13											
14		1.34	1.47			1.52	1.36	1.28	1.18		
19			1.40	1.51							
20			1.43								
23	1.08	1.23	1.39	1.60		1.58	1.47	1.34	1.37		
26							1.45	1.32			
27	1.30	1.39	1.47	1.61		1.62	1.44	1.33	1.24		
28		1.40	1.50	1.62		1.62	1.51	1.40	1.33		
29	1.23	1.36	1.46								
31	1.24	1.39	1.47								
Means	1.21	1.35	1.45	1.57		1.58	1.45	1.34	1.28		
Departures	-.13	-.13	-.11			-.03	-.03	-.01			

LINCOLN, NEBR.

December	Air mass									mb.	mb.
	4.77	3.81	2.86	1.91	*0.95	1.91	2.86	3.81	4.77		
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.		
5						1.14	1.01	0.92	3.5	4.4	
8		1.00	1.13						2.9	2.9	
10						1.11	.96	.89	4.0	3.8	
11	0.77	.87	1.04			1.11	.98	.85	1.4	3.7	
12	.77	.87	1.09			1.18	1.04	.98	1.7	4.4	
13	.77	.96	1.11			1.18	1.05	.96	2.1	3.7	
15	.92	1.04	1.18			1.27	1.15	1.04	2.6	2.9	
20	.92	1.00	1.13			1.16	1.01	.92	4.2	6.1	
27	.79	.94	1.11						4.8	6.1	
Means	.82	.95	1.11			1.16	1.03	.95			
Departures	.00	-.01	.00			.00	.00	.00			

TABLE MOUNTAIN, CALIF.

December	Air mass									mb.	mb.
	3.76	3.01	2.26	1.51	*0.75	1.51	2.26	3.01	3.76		
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.		
6				1.50							
7				1.55							
9				1.54							
13				1.53							
21				1.45							
23				1.51							
24				1.48							
25				1.57							
26				1.51							
27	1.21	1.30	1.41	1.53							
31				1.53							
Means	(1.21)	(1.30)	(1.41)	1.52							
Departures	-.01	-.02	-.01	-.01							

TABLE 1.—Solar radiation intensities during December 1947—Con.

Date	Sun's zenith distance								Vapor pressure		
	A. M.				0.0°	P. M.					
	78.7°	75.7°	70.7°	60.0°		60.0°	70.7°	75.7°			78.7°
	7.30 a. m. ¹	1.30 p. m. ¹									

BLUE HILL, MASS.

December	Air mass									mb.	mb.
	4.86	3.80	2.92	1.94	*0.97	1.94	2.92	3.80	4.86		
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.		
1	1.02	1.11	1.23							2.5	2.5
6							1.21	1.11	1.03	3.0	2.6
7	.93									4.1	3.5
10	1.02	1.08	1.21							2.6	3.0
11							1.21	1.10	.99	4.6	4.6
12	1.00									3.0	2.6
13							1.25	1.15	1.04	3.0	2.2
14								1.01	.90	1.4	1.8
17	.95	1.04								3.0	2.7
19							1.30	1.17	1.06	1.4	.9
20	1.03	1.14	1.24				.94	.76		1.7	2.1
22	.88	.99	1.11				1.13	1.02	.87	2.6	2.4
24							1.10	1.03	.95	3.6	3.2
25	1.01	1.11	1.22				1.24	1.11	1.00	1.7	2.4
29	.95	1.09	1.22				1.30	1.21	1.12	1.7	1.7
30	1.09	1.19	1.29				1.24	1.14		1.2	1.8
Means	.99	1.09	1.22				1.22	1.09	.97		
Departures	+.09	+.05	+.05				+.07	+.05	.00		

BOSTON, MASS.

December	Air mass									mb.	mb.
	4.96	3.96	2.97	1.98	*0.99	1.98	2.97	3.96	4.96		
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.		
4			1.03			1.12				6.7	1.7
10		.91								2.9	4.4
17	0.81	.93	1.10			1.31		0.89	0.76	3.0	2.6
19							1.16		.97	1.1	1.2
20	.76	.88	.99			1.19				1.8	3.0
22	.68	.78	.91			1.25		.83	.72	2.6	2.5
24	.51	.70								4.0	3.3
29	.82	.94	1.16			1.49	1.22	.98	.89	1.8	1.8
30	.97	1.08								1.1	1.9
Means	.76	.89	1.04			1.27	(1.19)	.90	.84		
Departures	+.03	+.03	+.02			.00	+.24	+.04	+.06		

RATIO, BOSTON/BLUE HILL ON COMPARABLE DATES

0.83	0.84	0.86				(0.92)	0.80	0.84		
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*Extrapolated.
¹ 75th meridian time.

LATE DATA FOR MADISON, WIS.

November	Air mass									mb.	mb.
	4.81	3.84	2.88	1.92	*0.96	1.92	2.88	3.84	4.81		
	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.		
13	0.71	0.88	1.08		1.45					2.0	2.6
Means	(0.71)	(0.88)	(1.08)		(1.45)						
Departures	-.16	-.01	-.06		-.07						

TABLE 2.—Daily totals and weekly means of solar radiation (direct+diffuse) received on a horizontal surface

[Gram calories per square centimeter]

Date	Washington, D. C.	Lincoln, Nebr.	New York, N. Y.	Fresno, Calif.	Fairbanks, Alaska	Columbia, Mo.	Boston, Mass.	Nashville, Tenn.	Twin Falls, Idaho	La Jolla, Calif.	Riverside, Calif.	Blue Hill, Mass.	Newport, R. I.	Salt Lake City, Utah	Put-in-Bay, Ohio	State College, Pa.	Davis, Calif.	Toronto, Canada	Ithaca, N. Y.	Boulder, Colo.	East Wareham, Mass.	Honolulu, Hawaii	Pearl Harbor, Hawaii
1947	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.	cal.
Dec. 3.....	198	27	142	137	T*	4	121	72	170	223	197	158	201	113	17	180	222	5	39	1	161	265	214
Dec. 4.....	144	25	214	260	2	190	175	189	120	68	76	213	201	136	84	185	165	149	139	204	212	319	336
Dec. 5.....	46	241	17	154	2	138	8	232	27	166	162	31	14	183	24	3	258	7	7	226	29	394	344
Dec. 6.....	81	46	204	260	T	66	174	189	113	184	180	210	168	78	40	51	208	43	40	194	202	397	390
Dec. 7.....	65	125	68	257	1	169	153	61	65	283	250	204	196	131	15	29	213	12	50	141	211	434	403
Dec. 8.....	41	225	30	269	3	262	6	58	86	225	257	22	25	31	30	87	193	39	16	179	20	415	376
Dec. 9.....	215	42	226	211	5	155	151	161	61	274	306	173	162	11	118	91	215	191	89	170	135	450	371
Means.....	113	104	129	221	2	140	113	138	92	203	204	145	138	98	47	90	211	64	54	159	138	382	348
Departures..	-46	-67	+4	+39	-4	-6	+8	+14	-29	-35	-18	+9	0	-24	-61	-31	+34	-24	-44	-34	+1	-----	-----
Dec. 10.....	52	166	152	117	6	67	152	28	168	265	308	204	195	148	31	74	208	40	44	220	201	372	363
Dec. 11.....	126	264	170	229	3	41	126	17	184	262	269	181	189	140	52	48	219	132	62	165	152	378	348
Dec. 12.....	175	265	193	248	3	31	158	117	197	285	276	197	191	223	51	182	161	176	114	207	196	233	271
Dec. 13.....	75	261	129	254	2	254	182	167	178	253	280	201	178	182	201	107	216	74	71	201	184	354	366
Dec. 14.....	177	161	143	206	1	269	159	231	182	214	225	205	221	47	191	167	198	47	115	193	216	316	403
Dec. 15.....	59	242	60	216	4	76	108	15	126	186	231	164	168	178	41	69	184	117	107	224	150	391	408
Dec. 16.....	211	190	108	218	8	242	112	165	166	258	269	140	158	204	44	105	120	106	41	217	153	444	379
Means.....	125	221	136	213	4	140	142	106	171	246	261	185	186	160	87	103	186	99	79	204	179	355	363
Departures..	-16	+59	+18	+46	0	-11	+26	-22	+43	+10	+49	+43	+35	-33	-19	-10	+18	+4	-35	+12	+20	-----	-----
Dec. 17.....	211	227	161	72	T	253	170	244	40	182	192	195	213	58	50	161	88	92	102	129	205	429	301
Dec. 18.....	219	190	131	151	1	232	101	235	165	272	268	113	113	43	62	35	88	163	112	104	105	265	316
Dec. 19.....	157	175	141	86	3	228	168	180	165	270	235	200	209	130	148	160	86	172	110	207	199	425	393
Dec. 20.....	215	238	189	43	2	198	157	193	62	254	274	201	212	30	168	196	80	104	161	163	220	380	328
Dec. 21.....	174	129	102	226	3	127	124	84	157	190	240	147	126	158	65	27	165	47	40	40	122	404	384
Dec. 22.....	190	26	174	198	1	87	156	175	170	180	274	211	216	156	90	130	128	20	100	48	203	446	421
Dec. 23.....	80	221	20	70	4	178	7	188	199	281	276	32	60	165	80	63	107	100	28	302	24	349	328
Means.....	178	172	131	121	2	186	126	185	137	233	251	157	164	106	96	110	97	100	93	128	154	386	353
Departures..	+28	+2	+19	-23	-3	+28	+13	+30	+21	+9	+37	+19	+25	-24	-21	-19	-8	+4	-7	-64	-9	-----	-----
Dec. 24.....	242	197	210	38	12	165	168	64	172	285	273	218	208	138	133	212	102	111	115	96	154	468	418
Dec. 25.....	160	206	150	77	3	214	164	173	167	274	266	227	226	132	56	205	50	123	178	191	222	312	319
Dec. 26.....	157	185	5	53	4	245	6	153	171	270	277	28	24	139	77	61	73	14	40	-----	20	430	366
Dec. 27.....	132	222	130	72	1	244	36	245	174	264	274	65	85	131	135	76	46	53	192	73	434	412	-----
Dec. 28.....	235	218	189	116	T	253	92	229	37	251	274	107	151	102	114	77	75	180	58	216	109	336	392
Dec. 29.....	221	151	216	178	T	245	206	226	92	142	175	233	242	172	198	186	258	159	136	166	216	422	354
Dec. 30.....	158	102	164	251	T	143	200	41	51	269	306	226	201	196	26	153	259	16	138	71	215	423	408
Dec. 31.....	163	57	48	210	7	1	96	96	186	264	298	118	98	94	10	2	118	14	35	215	112	-----	-----
Means (8-day).....	184	167	139	124	3	189	121	154	131	252	268	153	154	138	94	122	122	83	94	164	140	404	381
Departures..	+39	+8	+18	-16	-2	+45	+15	+69	+2	+28	+60	+27	+21	-4	+12	+27	-2	0	-4	-19	+5	-----	-----

ACCUMULATED DEPARTURES ON DECEMBER 31, 1947

+5,397	-1,883	-5,677	+8,001	-----	-----	+1,603	+1,309	-1,470	-7,567	+9,093	+1,533	-3,129	-----	-----	-6,020	+3,920	-1,680	-----	-1,757	-----	-----	-----	-----
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PERCENTAGE DEPARTURES FOR THE YEAR¹

+4.4	-1.4	-3.5	+4.9	-----	-----	+1.5	+1.1	-1.0	-5.0	+6.0	+1.4	-2.5	-----	-----	-5.2	+2.4	-1.6	-----	-1.3	-----	-----	-----	-----
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*Trace, less than 0.6.

¹ Percentage departure for the year for Madison, Wis. (not listed) was +1.2.

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR
DECEMBER 1947

NOTE: Publication of "Positions, Areas, and Counts of Sunspots" in the MONTHLY WEATHER REVIEW will be discontinued with the December 1947 issue. The data will be issued thereafter through publications of the U. S. Naval Observatory, at various times depending on the sunspot activity. Current data will be distributed monthly to a limited number of persons on request addressed to Superintendent, U. S. Naval Observatory, Washington 25, D. C.

LUCY T. DAY

[Equatorial Division, U. S. Naval Observatory]

[Communicated by the Superintendent, U. S. Naval Observatory.] All measurements and spot counts were made at the Naval Observatory from plates taken at the observatories indicated. Difference in longitude is measured from the central meridian, positive toward the west. Latitude is positive toward the north. Areas are corrected for foreshortening and expressed in millionths of Sun's hemisphere. For each day under Mount Wilson group number, longitude, latitude, area of spot or group, and spot count, are included respectively: number of groups, assumed longitude of center of the disk, assumed latitude of center of the disk, total area of spots and groups, and total spot count.

Date	East- ern stand- ard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate qual- ity	Observatory
			Dif- ference in longi- tude	Lon- gi- tude	Lat- tude	Dis- tance from cen- ter of disk				
1947 Dec. 1	A m									
	10 56	8050	-72	100	-12	72	194	2	F	U. S. Naval.
		8058	-31	141	-15	34	291	1		
		8058	-26	146	-15	30	242	6		
		8051	-6	166	+24	24	24	1		
		8051	+2	174	+25	24	56	1		
		8051	+6	178	+26	26	24	1		
		8053	+10	182	-22	25	73	7		
		8052	+12	184	-7	14	48	1		
		8048	+25	197	+28	35	73	4		
		8048	+28	200	+25	36	97	8		
		8050	+26	198	+18	31	24	5		
		8056	+30	202	-26	39	97	6		
		8055	+40	212	-18	43	24	1		
		(9)		(172)	(+1)		1,247	44		
2	10 22	8060	-78	81	+10	78	194	2	F	Do.
		8060	-65	94	+10	65	24	1		
		8059	-59	100	-11	60	73	2		
		8058	-14	145	-15	21	533	8		
		8053	+22	181	-22	31	61	6		
		8052	+27	186	-7	28	24	1		
		8048	+38	197	+28	44	48	3		
		8048	+41	200	+25	46	73	6		
		8056	+44	203	-26	50	24	3		
		(7)		(159)	(+1)		1,054	32		
3	11 12	8060	-64	82	+8	64	97	3	G	Do.
		8060	-62	84	+10	62	145	1		
		8060	-50	96	+10	50	61	1		
		8059	-46	100	-12	48	48	1		
		8058	-5	141	-15	17	291	7		
		8058	+7	183	-16	19	218	4		
		8053	+36	182	-22	41	121	3		
		8052	+42	188	-7	43	12	1		
		8052	+45	191	-7	46	12	3		
		8048	+53	199	+25	57	24	1		
		8048	+56	202	+24	58	97	2		
		8056	+55	201	-26	60	12	3		
		8056	+59	205	-23	61	12	1		
		(7)		(146)	(+1)		1,150	31		
4	10 55	8064	-64	60	+13	64	48	3	G	Do.
		8063	-52	81	+16	54	97	6		
		8060	-49	84	+9	49	109	1		
		8060	-48	85	+7	48	97	8		
		8060	-38	95	+9	39	48	6		
		8059	-33	100	-12	36	48	3		
		8058	+8	141	-15	18	194	9		
		8058	+14	147	-15	21	12	5		
		8058	+20	153	-16	26	242	15		
		8053	+51	184	-22	55	48	3		
		8048	+66	199	+26	68	97	2		
		8048	+70	203	+24	72	145	3		
		(7)		(133)	(+1)		1,185	64		
6	12 12	8065	-80	26	-14	80	97	1	VG	Do.
		8065	-79	27	-12	79	388	3		
		8065	-68	38	-15	69	339	7		
		8065	-65	41	-11	66	145	2		

See footnotes at end of table.

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR
DECEMBER 1947—Continued

Date	East- ern stand- ard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate qual- ity	Observatory
			Dif- ference in longi- tude	Lon- gi- tude	Lat- tude	Dis- tance from cen- ter of disk				
1947 Dec. 6	A m									
	12 12	(*)	-65	41	+9	66	61	2	VG	U. S. Naval.
		8064	-39	67	+13	41	145	1		
		8064	-35	71	+13	37	24	4		
		8063	-25	81	+16	30	97	8		
		8060	-21	85	+9	23	145	2		
		8060	-10	96	+8	13	24	3		
		8062	+18	124	-15	23	73	10		
		8062	+19	125	-10	21	36	11		
		8062	+21	127	-15	25	61	6		
		8058	+36	142	-15	38	145	18		
		8058	+46	152	-16	48	242	12		
		(7)		(106)	(0)		2,022	90		
9	10 21	8067	-81	346	-23	81	48	1	G	Do.
		8065	-40	27	-13	42	921	30		
		8065	-29	38	-14	32	61	1		
		8065	-28	39	-11	31	24	5		
		8065	-27	40	-10	29	73	1		
		8064	0	67	+13	13	61	9		
		8064	+3	70	+11	12	24	10		
		8063	+17	84	+13	22	36	7		
		8060	+19	86	+8	21	97	2		
		8062	+55	122	-15	87	24	1		
		8062	+63	130	-15	65	48	3		
		8061	+71	138	-17	71	24	3		
		8066	+76	143	-21	76	24	1		
		8058	+80	147	-17	80	194	6		
		(8)		(67)	(0)		1,650	79		
10	11 37	8069	-78	335	+18	50	48	1	F	Do.
		8067	-69	344	-23	79	73	1		
		8068	-55	358	-12	56	48	3		
		8065	-26	27	-12	28	1,261	23		
		8065	-16	37	-13	20	97	6		
		8065	-11	42	-10	15	61	1		
		8064	+13	66	+13	18	73	8		
		8063	+32	85	+13	34	121	6		
		8060	+32	85	+8	33	145	1		
		8062	+77	130	-15	77	48	2		
		(8)		(53)	(0)		1,975	50		
11	10 29	8069	-65	336	+17	67	48	1	G	Do.
		8067	-57	344	-23	60	36	1		
		8068	-42	359	-11	44	194	7		
		8065	-16	25	-17	23	194	11		
		8065	-14	27	-12	18	873	30		
		8065	-3	38	-13	13	48	12		
		8065	-1	40	-14	14	61	1		
		8065	+2	43	-11	11	61	1		
		8064	+25	66	+11	27	12	1		
		8070	+36	77	-12	38	16	3		
		8063	+45	86	+13	48	97	6		
		8060	+45	86	+8	46	145	1		
		(8)		(41)	(0)		1,785	74		
12	11 5	8069	-81	336	+18	55	36	1	G	Do.
		8067	-44	343	-22	48	24	1		
		8068	-29	358	-10	30	97	7		
		(*)	-22	5	-14	24	24	1		
		(*)	-20	7	-16	25	48	6		
		8065	-3	24	-16	16	242	13		
		8065	-1	26	-12	11	824	29		
		8065	+10	37	-13	15	97	9		
		8065	+12	39	-14	18	48	1		
		8065	+15	42	-12	17	61	1		
		8070	+50	77	-13	51	48	1		
		8060	+58	85	+8	50	61	2		
		8063	+62	89	+13	63	48	3		
		(9)		(27)	(-1)		1,658	75		
13	10 44	8074	-79	265	-14	79	24	4	G	Mt. Wilson.
		8073	-78	296	+22	80	97	1		
		8072	-47	327	-22	51	73	12		
		8069	-39	335	+18	42	16	1		
		8067	-31	343	-22	36	12	1		
		8068	-16	358	-10	18	61	6		
		(*)	-10	4	-2	10	12	3		
		8071	-7	7	-17	17	48	8		
		8065	+12	26	-12	15	388	16		
		8065	+12	26	-16	18	194	12		
		8065	+17	31	-13	21	582	9		
		8065	+26	40	-14	28	97	16		
		8065	+28	42	-12	30	48	1		
		8070	+63	77	-12	63	36	1		
		8060	+71	85	+8	71	97	1		
		(11)		(14)	(-1)		1,785	92		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR
DECEMBER 1947—ContinuedPOSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR
DECEMBER 1947—Continued

Date	East- ern stand- ard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate qual- ity	Observatory
			Dif- fer- ence in longi- tude	Longi- tude	Lat- tude	Dis- tance from center of disk				
1947 Dec. 14	A m 15 41	8976	-70	279	+15	79	194	1	VG	Mt. Wilson
		8974	-63	295	-14	63	36	7		
		8973	-63	295	+22	65	73	1		
		8972	-33	325	-23	38	109	13		
		8972	-27	331	-22	33	242	25		
		8969	-24	334	+17	30	48	1		
		8967	-16	342	-22	25	12	1		
		8971	+10	8	-17	18	121	6		
		8971	+12	10	-17	20	158	14		
		8965	+27	25	-12	29	339	28		
		8965	+27	25	-16	30	145	26		
		8965	+32	30	-13	33	630	22		
		8965	+40	38	-14	42	97	15		
		8965	+43	41	-12	44	12	2		
		8975	+64	62	-7	64	36	10		
		8970	+78	76	-12	78	12	1		
		(10)	(358)	(-1)			2,264	173		
16	10 52	8983	-73	262	+20	74	109	1	G	U. S. Naval.
		8983	-68	267	+17	70	48	3		
		8976	-60	275	+18	62	12	2		
		8976	-57	278	+17	60	339	1		
		8979	-55	280	-28	59	12	3		
		8981	-41	294	+19	46	12	1		
		8982	-41	294	-7	41	6	1		
		8973	-38	297	+22	43	61	1		
		8978	-37	298	-16	40	12	2		
		8972	-10	325	-24	24	73	6		
		8972	-2	332	-24	23	121	6		
		8969	+1	336	+16	17	48	7		
		8980	+4	339	+23	24	12	3		
		8967	+8	343	-23	23	6	6		
		8968	+25	0	-15	27	24	5		
		8971	+33	8	-18	36	218	14		
		8971	+39	14	-20	42	339	1		
		8965	+53	28	-15	54	194	15		
		8965	+58	33	-14	59	485	2		
		(14)	(335)	(-1)			2,131	80		
17	10 19	8984	-83	239	+23	83	194	1	VG	Do.
		8983	-59	263	+18	61	97	1		
		8976	-52	270	+18	56	24	2		
		8976	-47	275	+18	51	12	1		
		8976	-44	278	+16	46	291	1		
		8982	-28	294	-7	29	48	7		
		8973	-24	298	+22	33	48	1		
		8972	+3	325	-25	24	73	4		
		8972	+11	333	-24	25	145	2		
		8969	+13	335	+16	21	291	15		
		8967	+18	340	-21	27	36	4		
		8980	+19	341	+23	31	24	3		
		8971	+47	9	-18	50	485	11		
		8971	+52	14	-20	54	388	1		
		8965	+66	28	-13	66	291	9		
		8965	+71	33	-14	71	485	1		
		(11)	(322)	(-1)			2,932	64		
18	11 16	8984	-75	233	+23	78	97	4	F	Do
		8984	-69	239	+23	71	291	1		
		8985	-72	236	-2	72	24	3		
		8983	-45	263	+20	49	73	2		
		8976	-38	270	+18	42	24	3		
		8976	-30	278	+17	35	194	1		
		8982	-14	294	-8	16	48	2		
		8973	-12	296	+21	26	24	1		
		8972	+18	326	-25	30	36	1		
		8972	+26	334	-24	34	97	2		
		8969	+24	332	+10	26	6	1		
		8969	+25	333	+17	31	194	10		
		8969	+27	335	+15	32	291	12		
		8971	+59	7	-18	60	436	7		
		8971	+66	14	-19	67	242	1		
		8971	+69	17	-19	70	436	1		
		8965	+81	29	-13	81	291	1		
		(10)	(308)	(-1)			2,804	53		
19	10 47	8986	-70	225	+14	72	242	4	F	Do.
		8984	-62	233	+23	66	242	9		
		8984	-52	243	+23	57	388	1		
		8985	-58	237	-2	58	24	4		
		8983	-32	263	+19	37	73	3		
		8976	-24	271	+17	30	24	3		
		8976	-18	277	+16	25	242	2		
		8982	0	295	-8	7	97	5		
		8973	+2	297	+21	22	12	1		
		8969	+15	310	+15	21	24	2		
		8972	+31	326	-25	38	24	2		
		8972	+38	333	-24	43	97	2		
		8969	+38	333	+18	42	388	17		
		8969	+43	338	+14	44	145	8		
		8988	+40	335	+8	41	12	2		
		8971	+70	5	-16	70	436	3		
		8971	+80	15	-19	80	339	1		
		(12)	(295)	(-1)			2,809	69		

See footnotes at end of table.

Date	East- ern stand- ard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate qual- ity	Observatory
			Dif- fer- ence in longi- tude	Longi- tude	Lat- tude	Dis- tance from center of disk				
1947 Dec. 20	A m 10 30	8990 8986 8984 8984 8985 8983 8976 8982 8973 8989 8972 8969 8969 8988 8971	-75 -56 -48 -39 -45 -19 -4 +14 +15 +29 +45 +50 +51 +57 +53 +84	207 226 234 243 237 263 278 296 297 311 327 332 333 339 335 6	-21 +14 +22 +22 -2 +17 +14 -8 +21 +15 -24 -24 +19 +15 +8 -16	75 58 51 44 45 26 73 15 27 33 49 53 54 59 54 84	48 194 242 339 12 73 12 24 24 12 48 339 145 48 388	3 7 15 5 2 3 5 1 2 2 1 14 7 2 2	G	U. S. Naval.
		(13)		(282)	(-2)		2,239	74		
21	11 6	8990 8990 8990 8986 8992 8984 8984 8983 8976 8976 (*) 8972 8969 8969 8988	-70 -67 -60 -42 -35 -34 -25 -6 +10 +15 +20 +63 +64 +70 +66	199 202 209 227 234 235 244 263 279 284 289 332 333 339 335	-26 -23 -20 +14 -24 +22 +22 +17 +14 +14 -18 -24 +18 +15 +8	72 68 62 44 40 41 34 29 19 22 26 65 67 71 67	24 48 12 97 61 194 291 48 194 24 12 121 145 48	1 5 1 6 2 13 1 2 6 6 2 1 6 1	F	Do.
		(10)		(269)	(-2)		1,331	50		
22	11 4	8990 8999 8986 8986 8984 8984 8984 8992 8983 (*) 8976 8982 8991 8969 8969	-59 -53 -33 -26 -24 -22 -12 -23 +7 +17 +24 +38 +69 +79 +85	197 203 223 230 232 234 244 233 263 273 280 294 325 335 341	-27 -24 +14 +14 +23 +22 +22 -24 +18 +12 +15 -9 -17 +18 +14	61 56 36 30 29 32 26 32 21 22 30 39 70 80 85	97 145 24 12 73 170 388 97 24 12 194 36 48 145 97	6 3 5 3 10 8 2 12 4 3 1 5 3 2 1	G	Do.
		(10)		(256)	(-2)		1,562	68		
23	10 59	8994 8990 8990 8990 8986 (*) 8992 8984 8984 8984 8993 8976 8991	-68 -45 -38 -20 -19 -14 -8 -8 0 +2 +36 +50	174 197 204 222 228 234 234 234 242 244 278 322	-22 -27 -24 +14 -6 -21 +22 +22 +17 +15 +15 -18	70 51 42 26 26 26 24 24 339 17 39 80	12 73 48 48 12 21 48 194 339 24 194 242	2 2 5 8 2 2 2 12 7 3 1	G	Do.
		(9)		(242)	(-2)		1,295	47		
24	10 27	8996 8995 8994 8994 8990 8990 8986 8992 8992 8984 8984 8993 8976	-84 -74 -55 -50 -32 -25 -7 -1 +4 +5 +13 +13 +48	146 156 175 180 198 205 223 229 234 235 243 243 278	-13 -12 -21 -20 -26 -24 +14 -24 -21 +22 +21 -15 +15	84 74 57 52 52 38 18 22 20 27 27 18 51	339 24 48 194 48 48 73 73 48 97 267 12 73	2 1 2 6 2 1 3 3 5 8 9 8 1 1	F	Do.
		(9)		(230)	(-2)		1,344	49		
25	11 51	8996 8997 8995 8994 8994 8990 8990 8986 8992 8992 8984 8984 8984 8976	-70 -62 -60 -41 -35 -20 -12 +8 +15 +20 +18 +26 +26 +62	146 154 166 175 181 196 204 224 231 236 234 242 242 278	-14 +12 -13 -22 -21 -26 -24 +17 -23 -21 +21 +21 +15	70 63 60 45 38 30 24 24 25 28 30 35 63	339 24 97 291 242 24 48 48 194 145 73 291 73	1 3 3 3 2 1 2 3 3 2 1 4 1	P	Do.
		(9)		(216)	(-2)		1,889	29		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR
DECEMBER 1947—Continued

Date	East- ern stand- ard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate qual- ity	Observatory
			Dif- ference in longi- tude	Lon- gi- tude	Lat- tude	Dis- tance from cen- ter of disk				
1947 Dec. 26	A m 10 20		°	°	°	°				
		8998	-67	136	-17	68	97	5	G	U. S. Naval.
		8996	-58	145	-15	60	339	1		
		8995	-49	154	-15	50	12	2		
		8995	-45	158	-13	46	48	4		
		8997	-48	155	+12	50	12	1		
		8994	-31	172	-21	36	145	7		
		8994	-26	177	-20	31	170	11		
		8994	-22	181	-22	29	339	12		
		8990	-8	195	-26	25	24	2		
		8990	+1	204	-24	22	12	1		
		(*)	+23	226	-16	26	24	2		
		8986	+24	227	+17	30	24	1		
		8992	+28	231	-22	33	145	7		
		8992	+33	236	-21	37	291	11		
		8984	+30	233	+22	38	24	1		
		8984	+40	243	+20	45	145	2		
		8993	+45	248	-15	47	12	3		
		(11)		(203)	(-2)		1,863	73		
27	10 24								G	Do.
		8998	-54	136	-17	56	267	2		
		8996	-44	146	-15	46	291	1		
		8997	-38	152	+12	41	48	5		
		8995	-33	157	-13	35	48	3		
		8994	-17	173	-21	26	194	13		
		8994	-9	181	-22	22	485	2		
		(*)	-10	180	-13	14	24	5		
		8990	+7	197	-27	27	12	10		
		(*)	+18	208	-21	27	12	1		
		8986	+37	227	+13	40	121	9		
		(*)	+37	227	-16	39	12	1		
		8992	+40	230	-25	44	145	7		
		8992	+46	236	-24	49	291	15		
		8984	+53	243	+20	57	121	1		
		8993	+59	249	-15	60	6	1		
		(13)		(190)	(-2)		2,077	76		
28	10 20								F	Do.
		8998	-40	137	-17	42	291	3		
		8996	-31	146	-14	33	291	1		
		8997	-25	152	+12	29	194	7		
		8995	-21	156	-12	23	97	6		
		8994	-5	172	-22	20	170	6		
		8994	+4	181	-22	20	436	1		
		8990	+20	197	-26	30	12	1		
		8986	+50	227	+13	52	291	5		
		8992	+50	227	-23	53	145	4		
		8992	+59	236	-22	61	339	1		
		8984	+66	243	+21	68	121	1		
		(9)		(177)	(-3)		2,387	36		
29	10 56								G	Do.
		9000	-50	113	+17	54	24	2		
		8998	-27	136	-17	31	339	12		
		8996	-18	145	-13	21	291	1		
		8997	-12	151	+12	19	170	14		
		8995	-9	154	-12	12	194	15		
		8994	+9	172	-22	21	215	21		
		8994	+18	181	-22	25	509	1		
		8986	+62	225	+13	64	436	6		
		8986	+69	232	+12	70	242	1		
		8992	+64	227	-23	66	145	12		
		8992	+72	235	-22	73	436	1		
		8984	+80	243	+21	80	121	1		
		(9)		(163)	(-3)		3,125	87		
30	10 11								VG	Do.
		9002	-85	66	+7	85	97	1		
		9001	-83	68	-6	83	145	1		
		9000	-38	113	+17	42	24	7		
		(*)	-20	131	-7	20	12	5		
		8998	-16	135	-18	22	242	19		
		8998	-10	141	-17	17	291	24		
		8996	-5	146	-13	12	291	2		
		8997	-3	148	+13	16	61	4		
		8997	+2	153	+10	12	48	8		
		8997	+3	154	+12	15	73	3		

POSITIONS, AREAS, AND COUNTS OF SUNSPOTS FOR
DECEMBER 1947—Continued

Date	East- ern stand- ard time	Mount Wilson group No.	Heliographic				Area of spot or group	Spot count	Plate qual- ity	Observatory
			Dif- ference in longi- tude	Lon- gi- tude	Lat- tude	Dis- tance from cen- ter of disk				
1947 Dec. 30	A m 10 11		°	°	°	°				
		8995	+5	156	-14	12	97	9	VG	U. S. Naval.
		8995	+8	159	-11	11	36	10		
		8994	+20	171	-23	25	194	7		
		8994	+24	175	-22	31	73	8		
		8994	+30	181	-22	34	582	9		
		8986	+74	225	+13	74	291	4		
		8986	+83	234	+12	83	194	1		
		8992	+78	229	-23	79	291	3		
		(11)		(151)	(-3)		3,042	125		
31	10 26								F	Do.
		9002	-71	66	+7	71	97	1		
		9001	-69	68	-6	69	97	1		
		9000	-26	111	+16	32	73	4		
		(*)	-6	131	+4	10	12	1		
		8998	-5	132	-18	17	121	0		
		8998	+3	140	-17	16	242	1		
		8998	+4	141	-15	15	97	1		
		8996	+9	146	-14	13	291	1		
		8996	+13	150	-15	17	48	3		
		9003	+10	147	+26	31	109	4		
		8997	+16	153	+12	21	48	3		
		8995	+18	155	-14	21	61	5		
		8995	+21	158	-11	22	36	4		
		8994	+34	171	-23	38	194	5		
		8994	+44	181	-23	46	533	5		
		(10)		(137)	(-3)		2,059	80		

Mean daily area for 27 days = 1,951
Mean 10g+s for 27 days = 165.0

*Not numbered.
VG=very good; G=good; F=fair; P=poor.
†Mount Wilson charts not available.

PROVISIONAL RELATIVE SUNSPOT NUMBERS FOR
DECEMBER 1947

[Dependent on observations at Zurich Observatory and its stations at Locarno and Arosa]

December 1947	Relative numbers	December 1947	Relative numbers	December 1947	Relative numbers
1.....	110	11.....	108	21.....	92
2.....	86	12.....	122	22.....	100
3.....	105	13.....	110	23.....	95
4.....	90	14.....	131	24.....	117
5.....	89	15.....	136	25.....	104
6.....	97	16.....	107	26.....	170
7.....	120	17.....	133	27.....	159
8.....	110	18.....	121	28.....	142
9.....	99	19.....	109	29.....	135
10.....	114	20.....	140	30.....	129
				31.....	135

Mean, 31 days=116.6.

NOTE.—Publication of these data will be discontinued with this issue of the MONTHLY WEATHER REVIEW. They will continue to be issued quarterly, however, in the JOURNAL of TERRESTRIAL MAGNETISM AND ATMOSPHERIC ELECTRICITY.

THE FOLLOWING TABLES SHOW THE RESULTS OF THE RESEARCH IN THE FIELD OF POSITIVE RESULTS

TABLE I		TABLE II	
Year	Percentage	Year	Percentage
1950	100	1950	100
1951	95	1951	95
1952	90	1952	90
1953	85	1953	85
1954	80	1954	80
1955	75	1955	75
1956	70	1956	70
1957	65	1957	65
1958	60	1958	60
1959	55	1959	55
1960	50	1960	50

TABLE III		TABLE IV	
Year	Percentage	Year	Percentage
1950	100	1950	100
1951	95	1951	95
1952	90	1952	90
1953	85	1953	85
1954	80	1954	80
1955	75	1955	75
1956	70	1956	70
1957	65	1957	65
1958	60	1958	60
1959	55	1959	55
1960	50	1960	50

THE FOLLOWING TABLES SHOW THE RESULTS OF THE RESEARCH IN THE FIELD OF POSITIVE RESULTS

Chart I. Departure ($^{\circ}\text{F.}$) of the Mean Temperature from the Normal, and Wind Roses for Selected Stations, December 1947

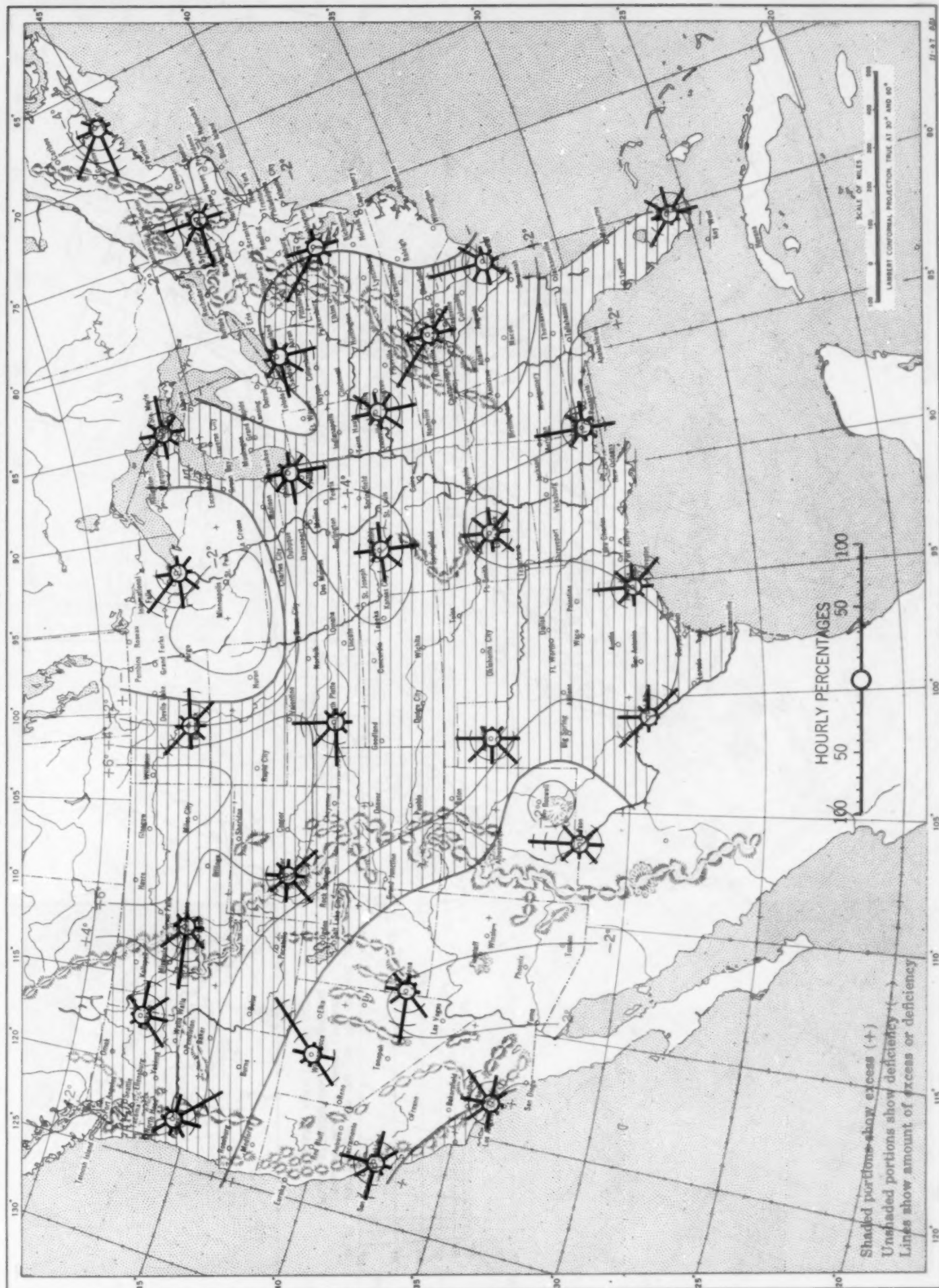


Chart II. Tracks of Centers of Anticyclones, December 1947. (Inset) August Departure of Monthly Mean Pressure from Normal

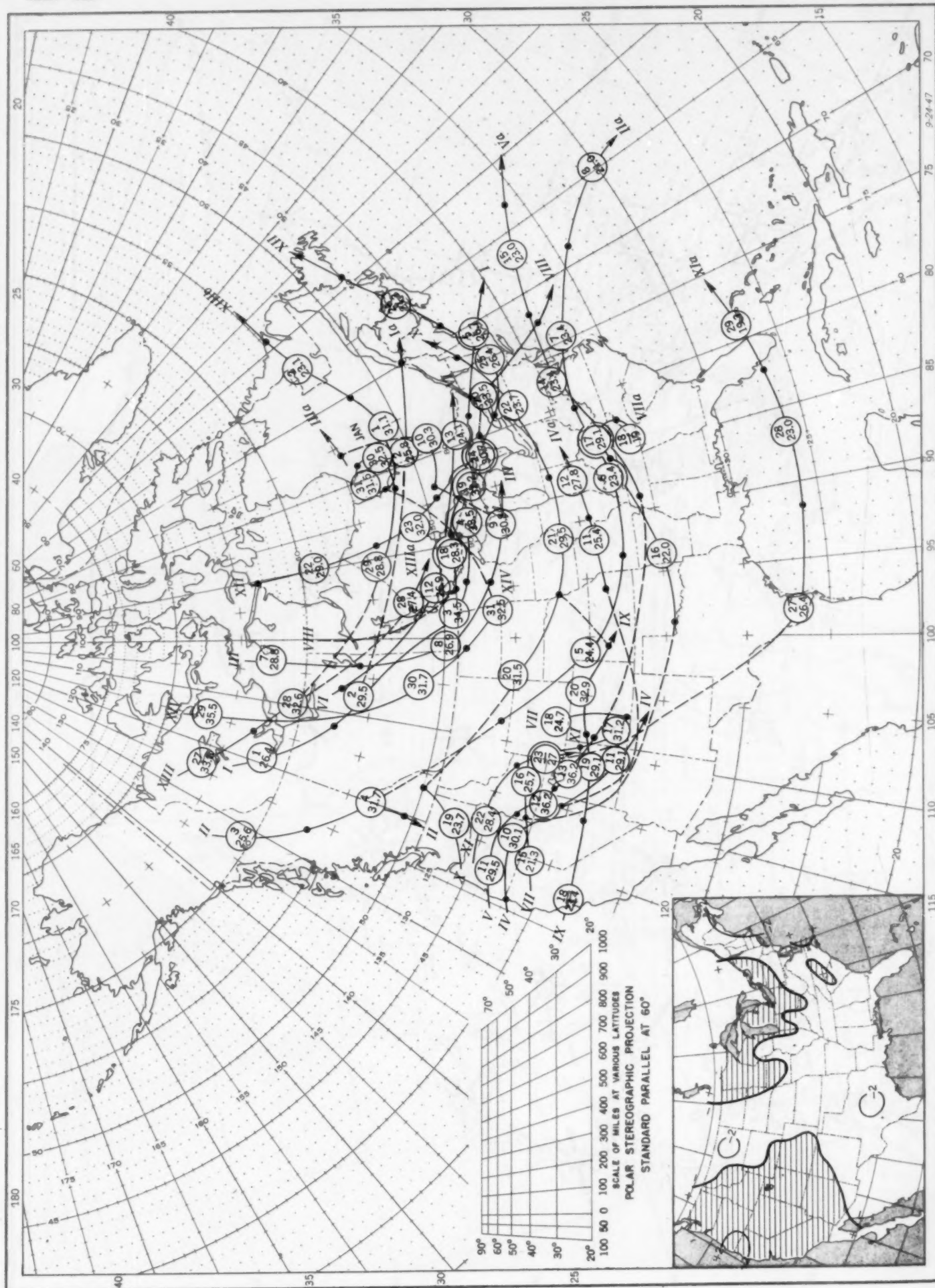


Chart III. Tracks of Centers of Cyclones, December 1947. (Inset) Change in Mean Pressure from Preceding Month

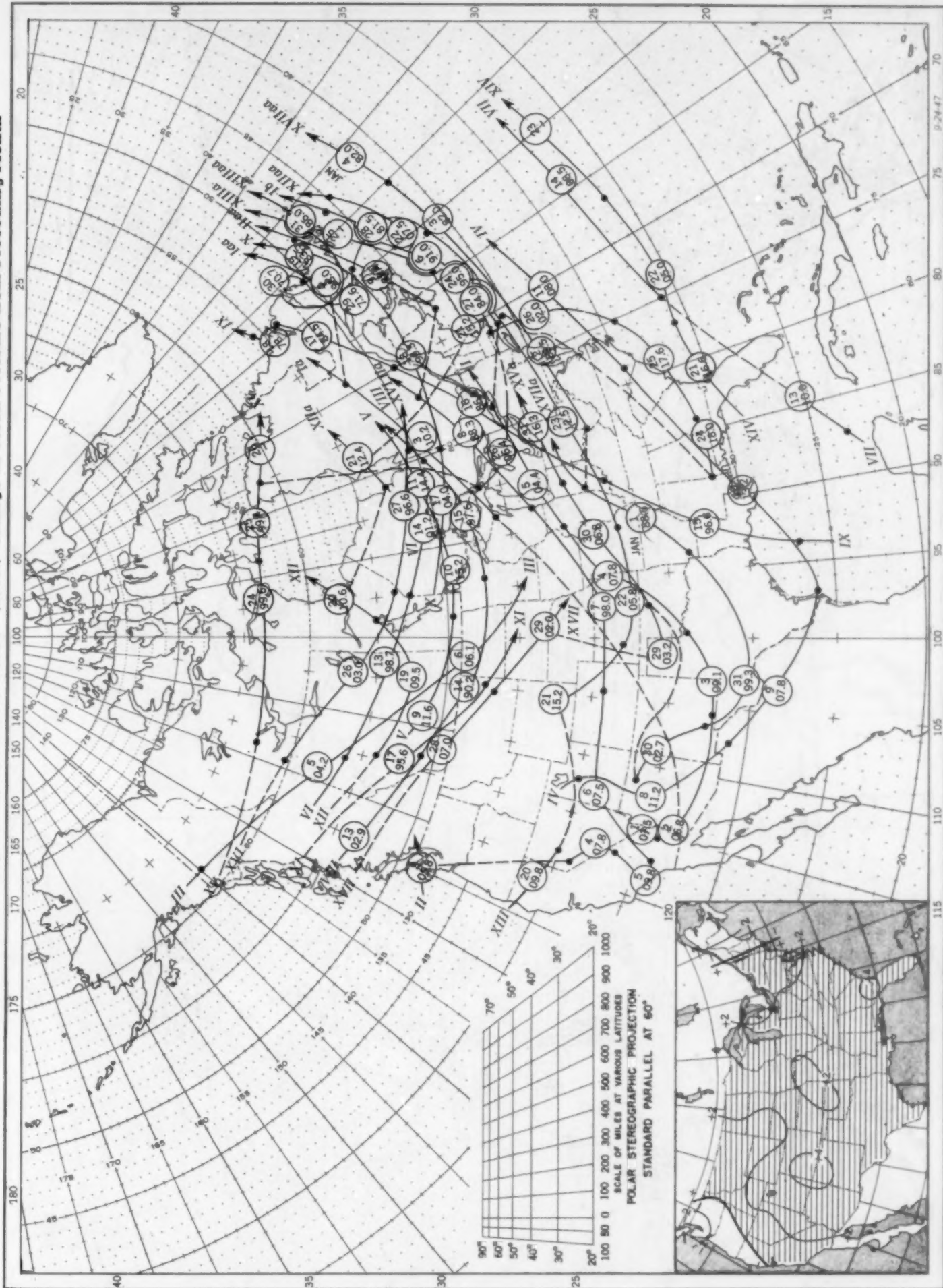


Chart IV. Percentage of Clear Sky Between Sunrise and Sunset, December 1947

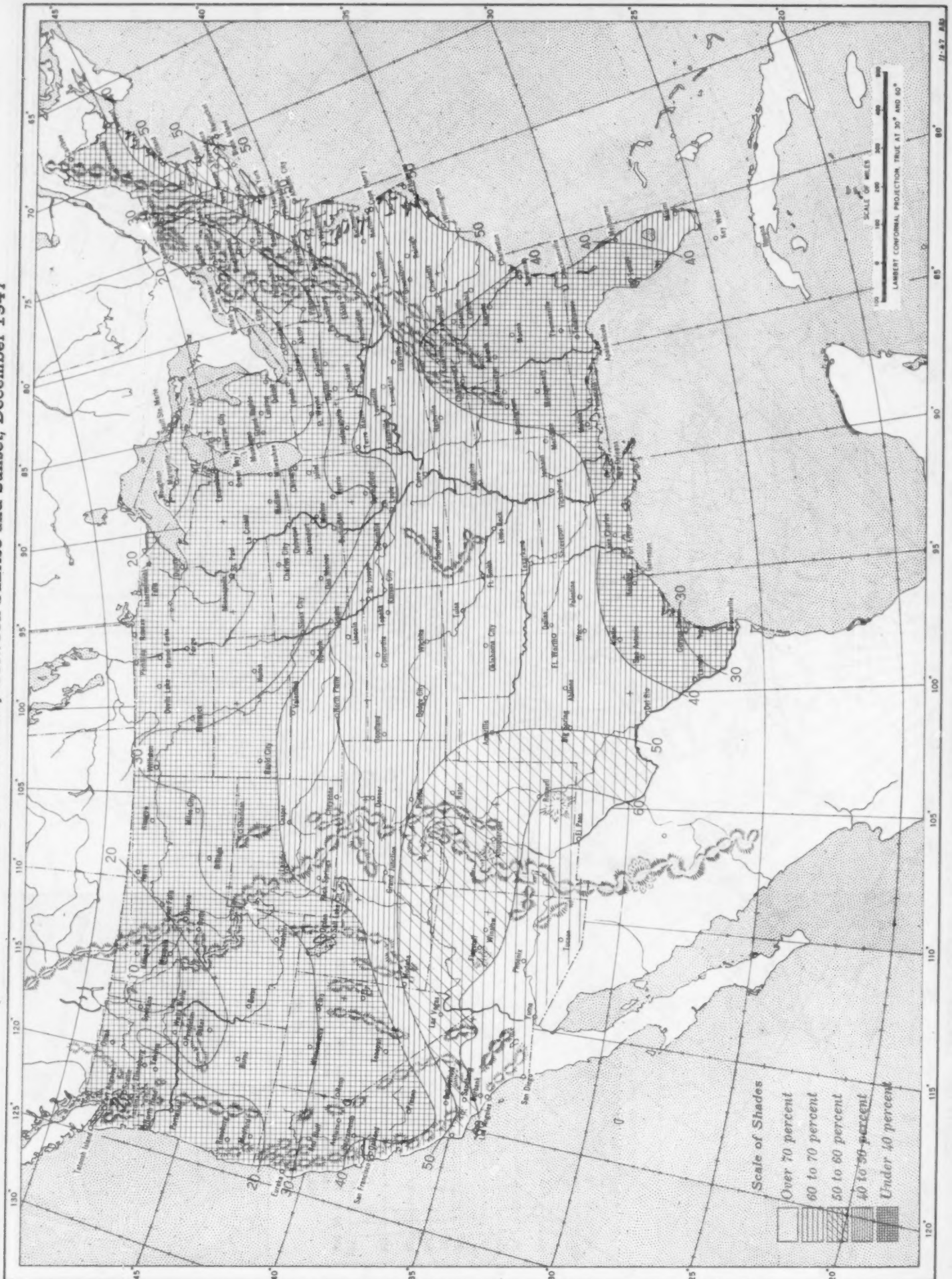


Chart V. Total Precipitation, Inches, December 1947. (Inset) Departure of Precipitation from Normal

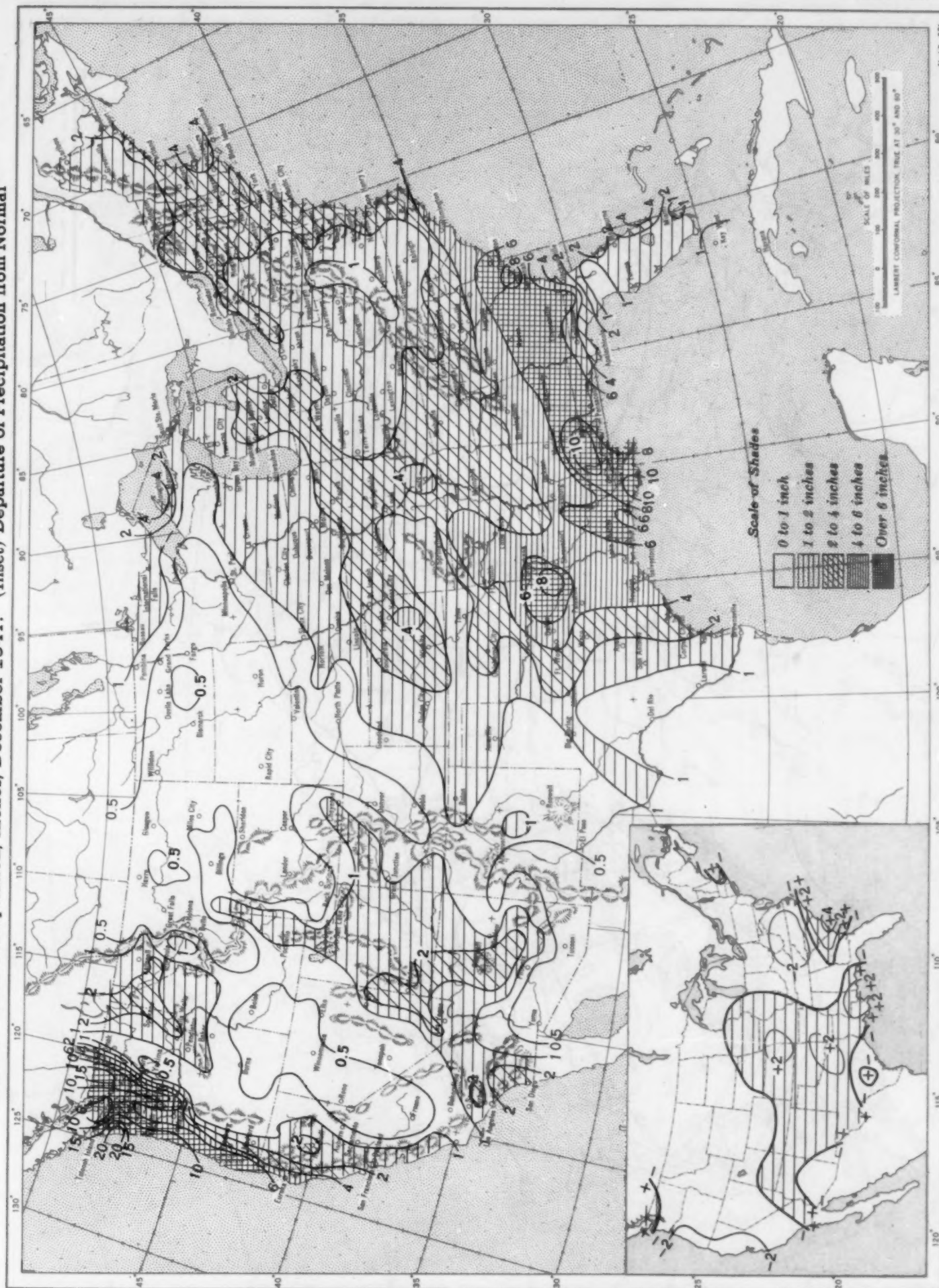


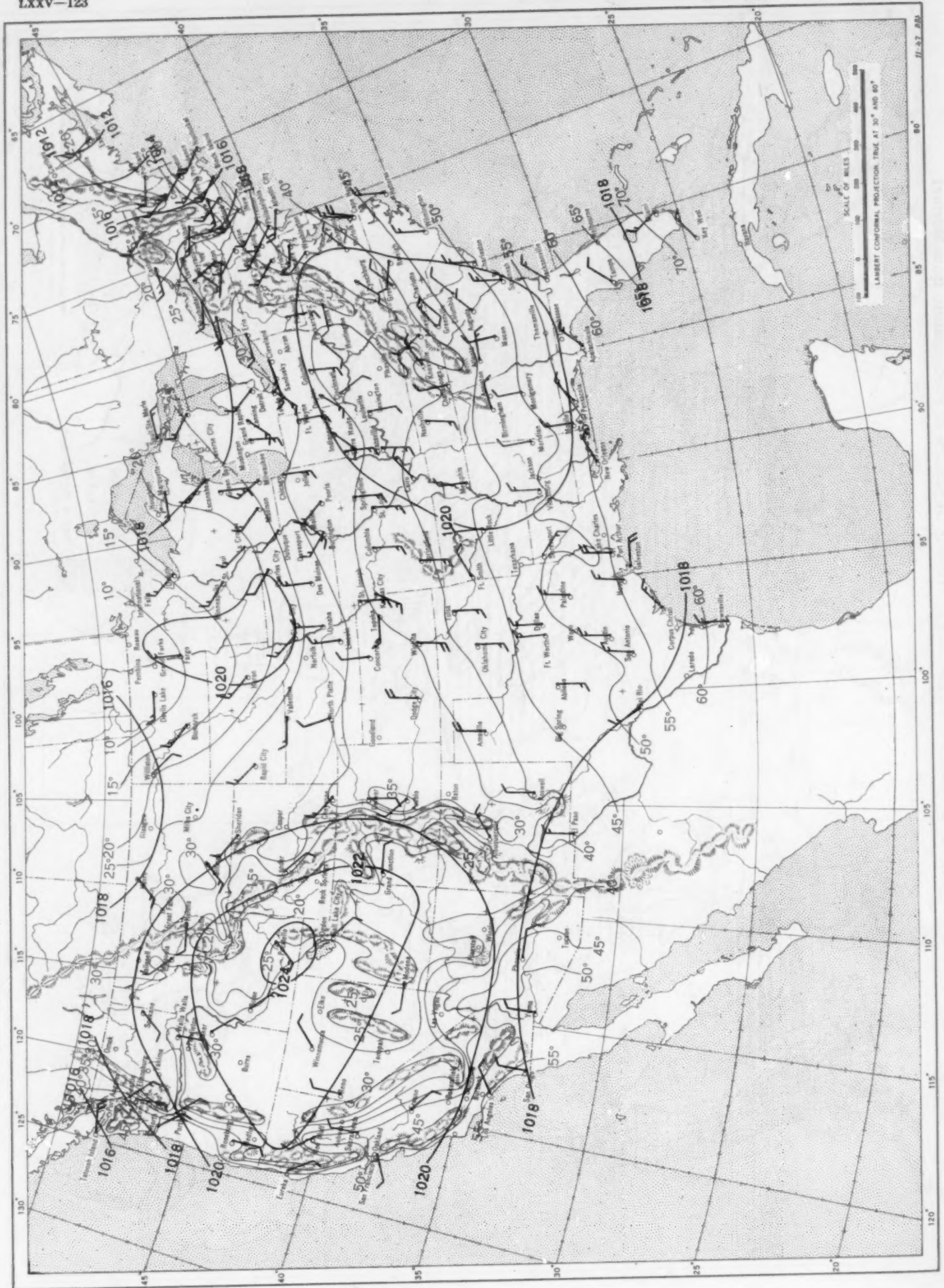
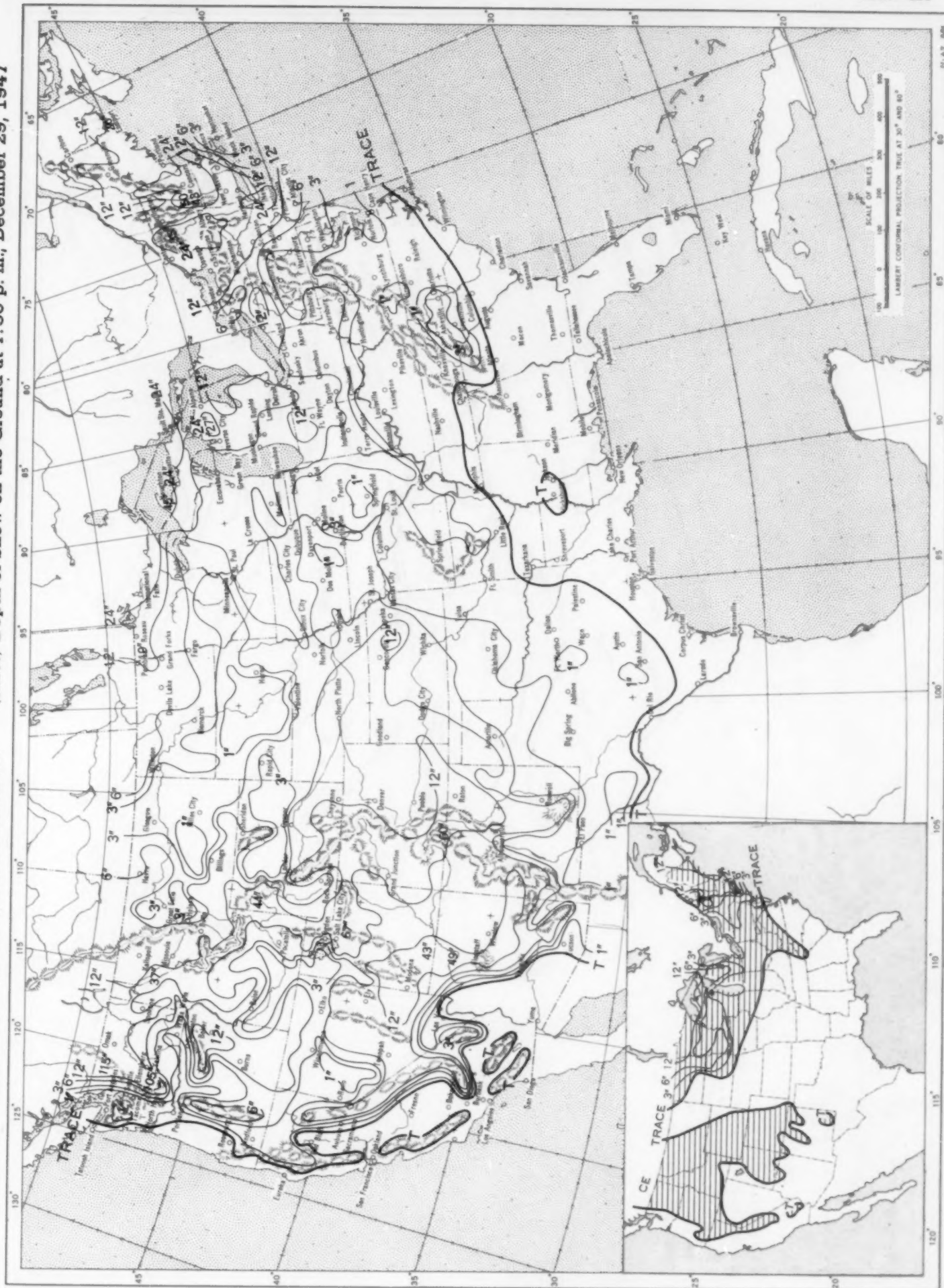
Chart VI. Isobars (mb.), at Sea Level and Isotherms ($^{\circ}$ F.) at Surface; Prevailing Winds, December 1947

Chart VII. Total Snowfall, Inches, December 1947. (Inset) Depth of Snow on the Ground at 7:30 p. m., December 29, 1947



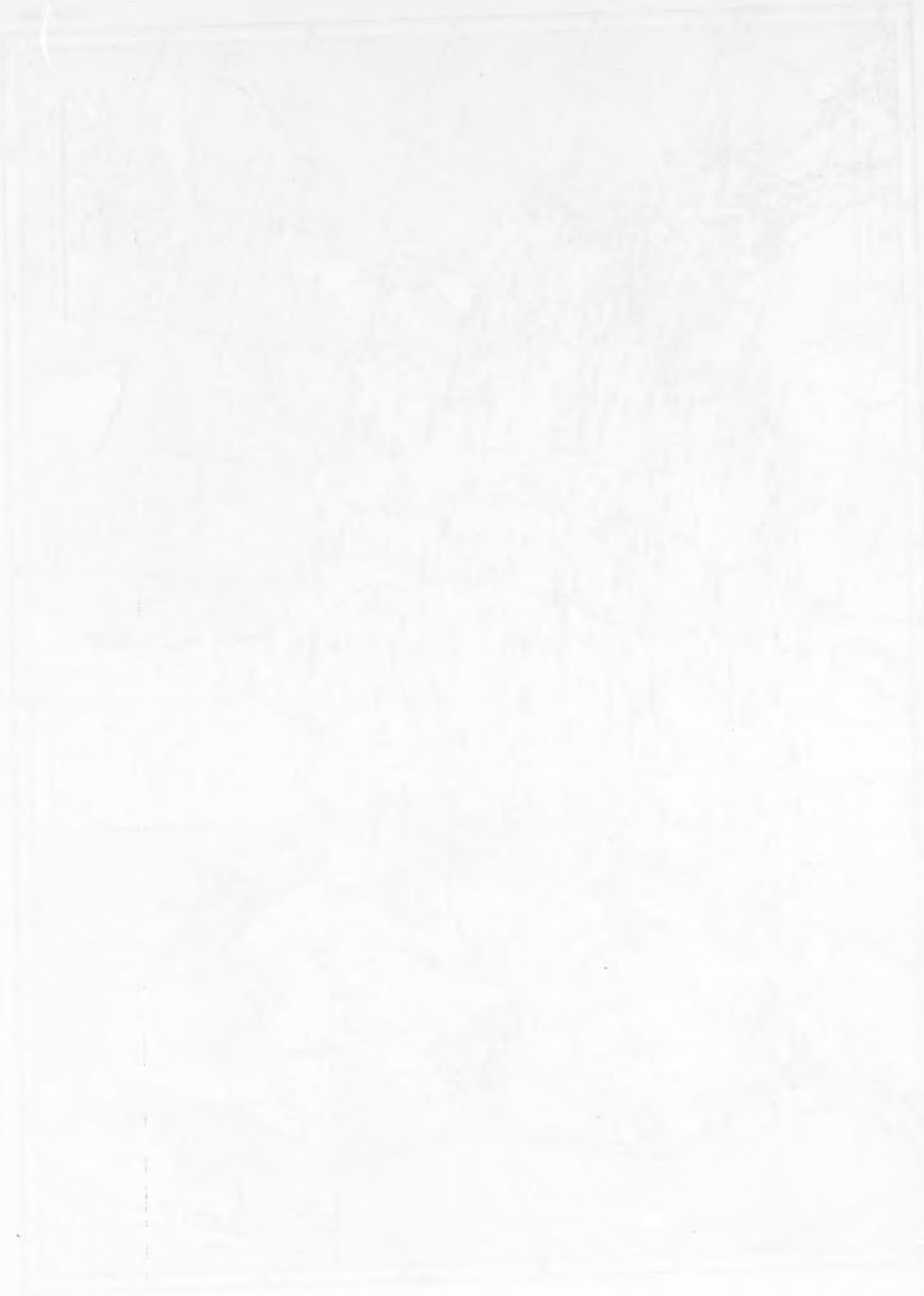
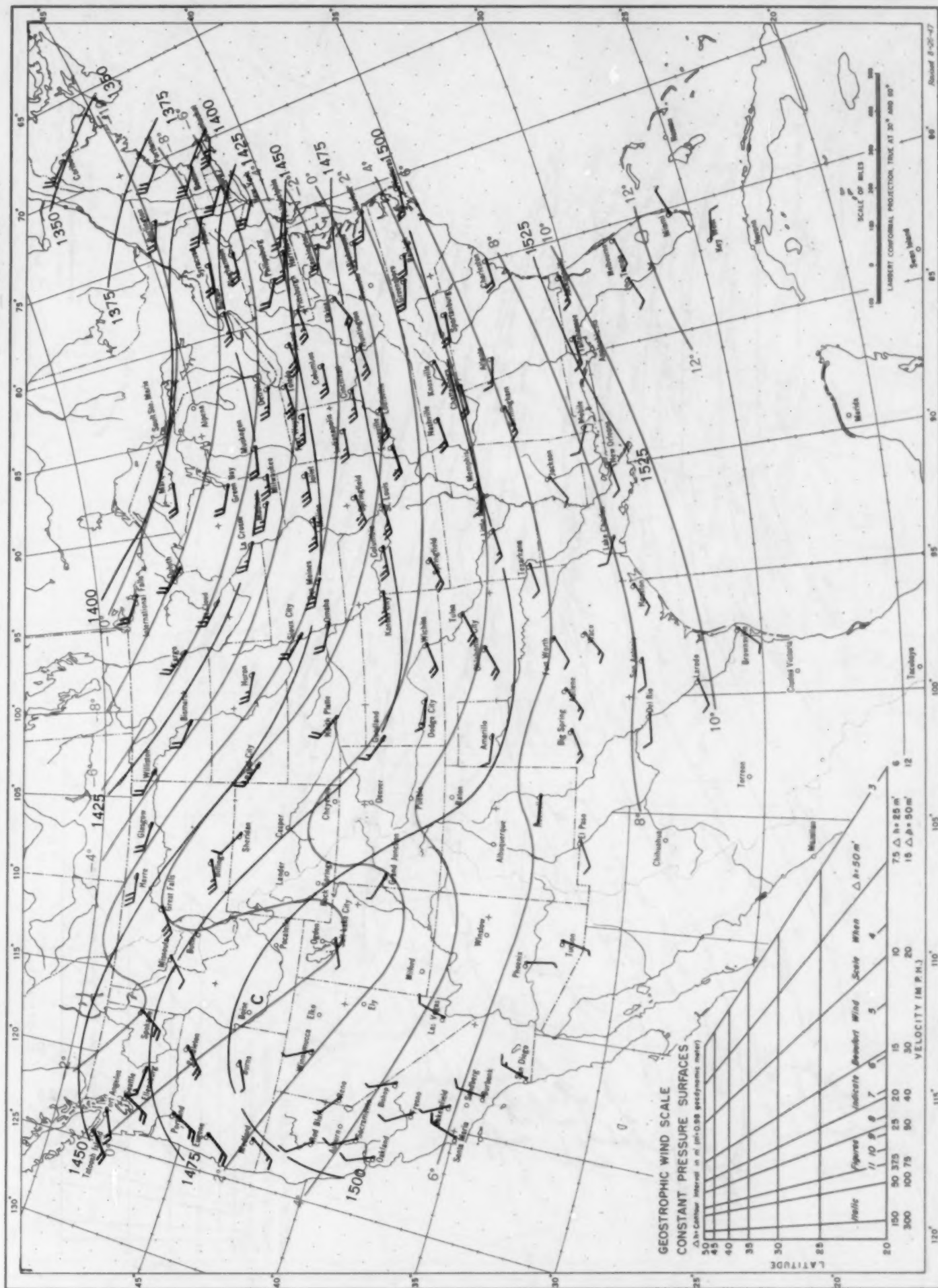


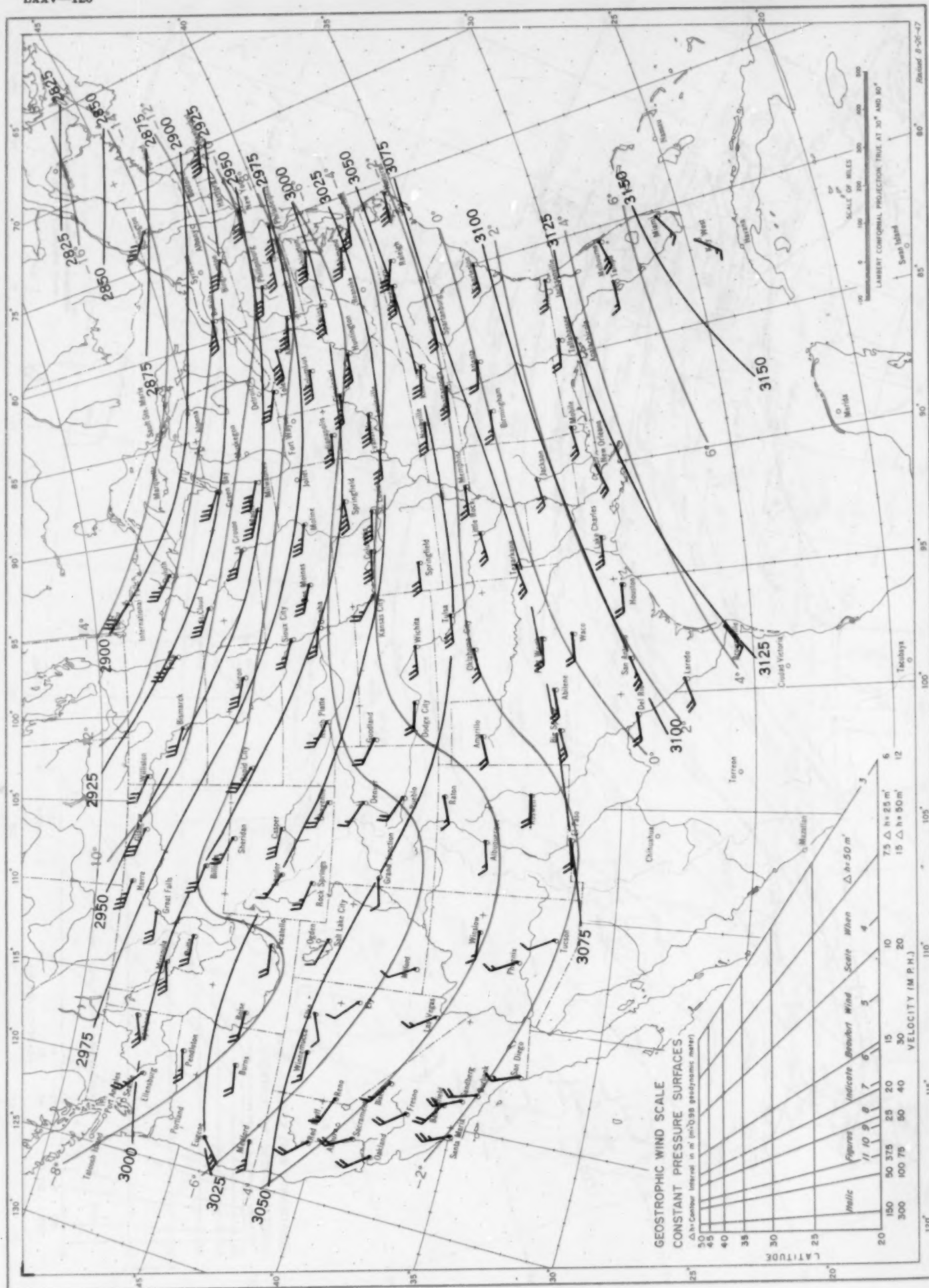
Chart VIII, December 1947. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in

Chart VIII, December 1947. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in Degrees Centigrade for the 850-millibar Pressure Surface, and Resultant Winds at 1,500 Meters (m.s.l.)



Contour lines and isotherms based on radiosonde observations at 0300 G.C.T., and winds based on pilot balloon observations at 2200 G.C.T.

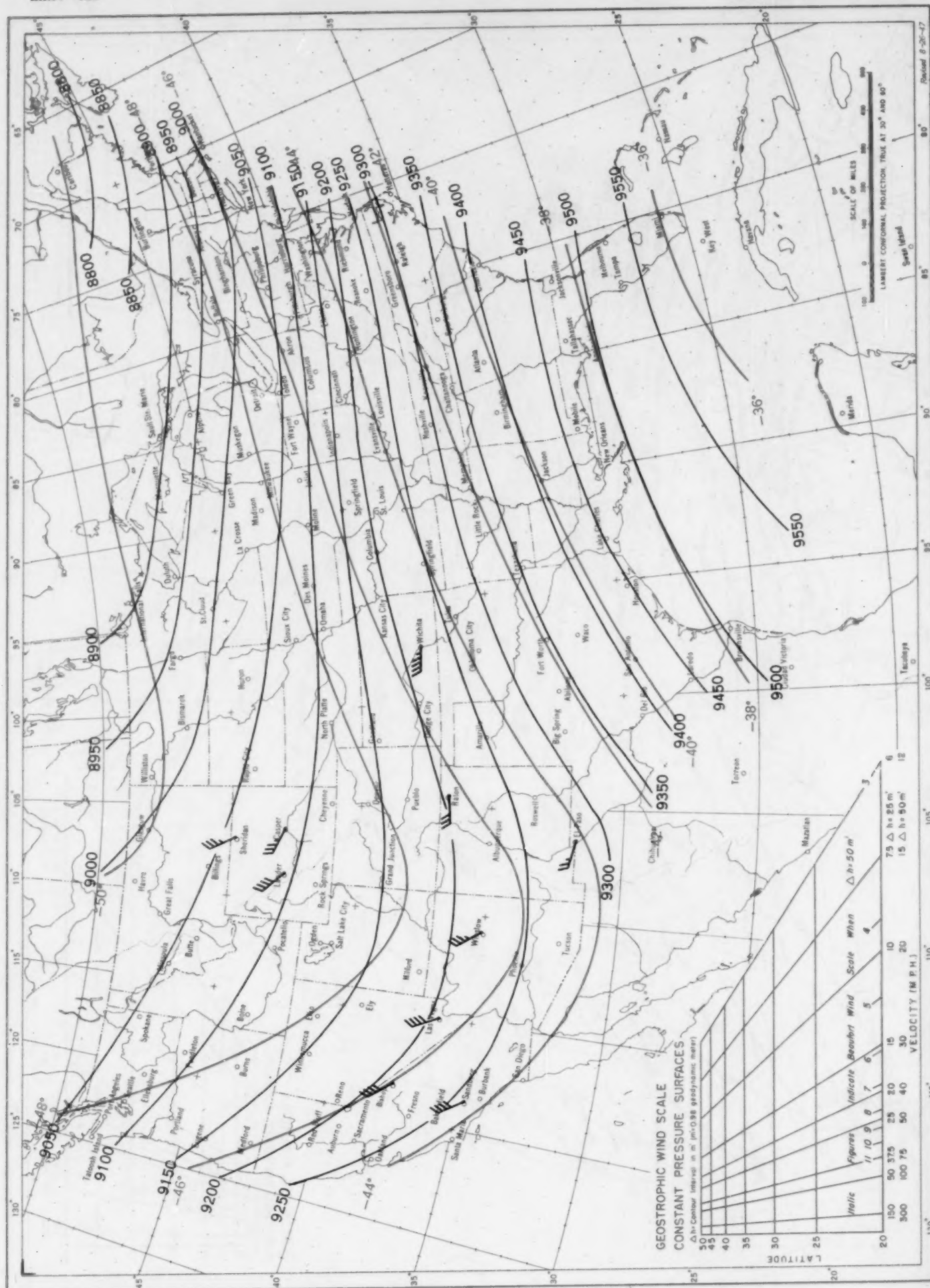
Chart IX, December 1947. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in Degrees Centigrade for the 700-millibar Pressure Surface, and Resultant Winds at 3,000 Meters (m.s.l.)



Contour lines and isotherms based on radiosonde observations at 0300 G.C.T., and winds based on pilot balloon observations at 2200 G.C.T.

Chart X, December 1947. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in

Chart XI, December 1947. Contour Lines of Dynamic Height (Geopotential) in Units of 0.98 Dynamic Meters and Isotherms in Degrees Centigrade for the 300-millibar Pressure Surface, and Resultant Winds at 10,000 Meters (m.s.l.)



Contour lines and isotherms based on radiosonde observations at 0300 G.C.T., and winds based on pilot balloon observations at 2200 G.C.T.

MONTHLY WEATHER REVIEW

The MONTHLY WEATHER REVIEW, as implied by its title, provides monthly meteorological and climatological data for the United States and adjacent regions; and in addition it publishes brief contributions, principally to synoptic meteorology and applied meteorology. The issue for each month is published as promptly as the statistical data can be assembled and printed; ordinarily, each number appears about seven weeks after the close of the month to which the data pertain.

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